MULTILATERAL AGREEMENTS IN THE SPACE SECTOR

By

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TABLE OF CONTENTS

TABLE

LIST OF FIGURES

Abstract of Thesis Presented to the Graduate School
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This study explores the factors that contribute to and inhibit the cooperation of national space agencies. By analyzing several prominent cooperative programs and key factors within each program, a number of important trends are revealed. Among the findings are the hegemony of the United States in the space sector, the unsustainability of informal agreements and the difficulty of arrangements that accompany program procurement.

CHAPTER 1
INTRODUCTION

> If anything makes nonsense of national boundaries, however useful and meaningful they may be in other ways, it is the earth satellite, orbiting every 90 minutes or so over different countries, transiting their boundaries without passports, travel documents customs inspection or even permission. Still more mocking of the narrow provincial spirit on earth is the light outward to the moon, Mars, to deep space.[1]

There are few areas of activity that dramatize the perpetual progress of man as much as space exploration. Public programs in the sector have huge budgets, timelines measured in epochs, and are usually among the most ambitious engineering endeavors ever undertaken. Despite their symbolic importance, space programs usually evade media attention less the occasional rocket or Space Shuttle launch.

In the United States (US), public investment in space is a relatively small fraction of the budget, a mere US$16.45 billion for 2006.[2] This figure pales in comparison to the FY07 request for the Department of Defense, over thirty times greater. In Europe, public investment is only a fifth of the US, approximately $3 billion. While private investment in the sector has increased significantly in the past decade, public investment is not commensurate to the ambitions and their associated price-tags of the administrators and scientists. To mitigate this lack of resources, one would expect a healthy amount of cooperation among friendly neighbors and allies. While there are a robust number of

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[1] L. Bloomfield. "Outer Space and International Cooperation." *International Organization*. 19.3 (1965): 605.

[2] United States. Office of the NASA Administrator. NASA's FY2006 Budget Request. Washington D.C.: Government Printing Office, 2005. May 2, 2006. http://www.globalsecurity.org/space/library/budget/fy2006-nasa/107493main_FY_06_budget_summ.pdf

bilateral agreements among the three-dozen space agencies, there is a remarkable absence of multilateral cooperation. [3]

This study investigates the question as to why multilateral agreements in space exploration and utilization have proven to be so difficult to conceptualize, draft and operate successfully. More specifically, how do three key factors, nationalist, economic and bureaucratic, inhibit or promote this cooperative process? These three key factors are present to differing degrees in all space-based arrangements, both bilateral and multilateral. It is in the multilateral setting, however, that their presence becomes significantly more complex and influential.

Before continuing, a brief introduction of the factors is merited. The first variable affecting cooperation is the nationalist forces that act centrifugally to cooperative agreements. This includes policymakers' concerns over security, competitive advantage, nationalism and national identity. The second bureaucratic factor is the procedural framework that is incorporated into an agreement. More specifically, this includes formal and informal distributions of authority, managerial interfaces and decision making processes among scientists, administrators and public officials.[4] The last factor affecting cooperation is the economic factor, or the procedures governing investment and procurement procedures. Actors and their institutional creations have adopted several different procedures to insure fair return to all those involved. "When resources abound and opportunities plentiful, cooperative attitude abounds. When resources shrink,

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[3] J. Pike. "World Space Guide." *GlobalSecurity.org*. 2006. April 24, 2006. http://www.globalsecurity.org/space/world/index.html.

[4] E. Sadeh. "International Space Cooperation." *Space Politics and Policy: An Evolutionary Perspective.* Ed. E. Sadeh. Norwell, MA: Kluwer Academic Publishing, 2002. 282.

altruism takes a back seat."[5] International cooperation in space has taken many different forms over the years in response to many different stimuli. There are several fundamental characteristics of the space bargaining process that define certain systemic properties, and it is around these properties the different responses form. The cooperative efforts operate not only in consideration of the fundamentals, but also of contemporary political context and the inherent nature of the task at hand.

These three factors are accounted for in all multilateral agreements and most bilateral ones as well. It is in the multilateral context, though, that their complexity and subsequent solutions offer interesting cases for study. The stage on which the actors and factors interact is governed by several, subtle fundamental properties. These qualities are specific to the space industry, and are born from characteristics unique to it alone, and to its history.

The most important fundamental characteristic is that of the primacy of the United States. The space industry is unique in that enormous sums of investment are necessary to accomplish noteworthy outcomes. There is not a linear progression of investment to results as there is in other industries. Small states are not able to contribute small amounts and remain competitive, neither are medium states for that fact. Only the largest players are capable of producing accomplishments commensurate with investment. The United States, drawing from what is by far the largest pool of resources, has an enormous technical upper-hand in the exploration and development of space based applications.

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[5] Reimar Luest. "The Cooperation of Europe and the United States in Space," The Fulbright 40th Anniversary Lecture, 6 April 1987. Washington, D.C. p. 5.

Cooperative agreements occur, then, either to the inclusion of the United States or to its apathy. To balance this, regional conglomerates, such as the European Space Agency (ESA), have formed, where unique national, bureaucratic and economic procedures have been developed insulated from US influence. However, these regional conglomerates are still incapable to publicly invest an amount equal to that of the US, and thus have relied must more on private investment.

A quick glance at the current state of the Galileo global positioning system (GPS) illustrates the degree to which US primacy is entrenched into the system. Galileo is a giant $4.3 billion, 4 year program requiring up to two dozen missions to complete a constellation of satellites that will be necessary for it successful operation.[6] Recently other regional powers have aligned themselves to cooperate with the mission as well, ranging from those with questionable American ties, such as China, to some of its closest allies, such as Israel and Japan. Washington has threatened to turn off its own GPS system in the global crisis, to which the French President Jacques Chirac responded "[Europe] could be American 'vassals' without their own navigation system,"[7] Washington, keenly aware of its primacy, has negotiated for the interoperability of the Galileo system with its Department of Defense run GPS system, despite the protests of several members. The agreement for interoperability gives the US the ability to jam the Galileo signal in the time of crisis or war, effectively negating one of the most important reasons for developing the system.[8]

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[6] "A system to make Jove proud" *The Economist.* December 29, 2005.

[7] Ibid.

[8] J. Johnson-Freese & A.S. Erickson. "The Emerging China-EU Space Partnership: A Geotechnical Balancer." *Space Policy.* 22.1 (2006) pg 21.

This example demonstrates another important fundamental element of the system: in the realm of international agreements there is an overwhelming culture of insecurity. In this culture policymakers are quick to take security precautions in to account regardless of potential benefits. Thus the states must be very sensitive of any potential encroachments of the security of any actor involved. The cases will reveal the means by which actors accommodate the factors in the cooperative frameworks.

History and experience have shown the development of two important conclusions in the study of multilateral cooperative space agreements. The first is that the projects must maintain equilibrium between the means, the resources available through the dedicated bureaucratic channels, and the ends, maintaining an appropriate scope of the project commensurate with the former. The delicate balance must be maintained for long-term sustainability. If the scope of the project exceeds the necessary available means, it will fail invariably, often in a manner that discourages future cooperation. If the cooperative agreement fails to produce results, whether functional or symbolic, that corresponds to the levels of participation by members, centrifugal forces will pull the agreement apart.

The equilibrium and disequilibrium appear throughout the literature on the subject and in the case studies. The first scenario is captured in the Interagency Consultative Group (1981) case. While the first phase of the project was universally agreed upon as a success, the transition to the second phase was disastrous. Policymakers were keen to increase the scope of project following previous accomplishment, without increasing necessary resources and bureaucratic capabilities. The Group was left incapacitated to accomplish the task before it, the coordination of 30 satellites studying solar physics.

The latter example was experienced by the ESA prior to its Horizon 2000 program. The agency had failed to produce a program outside the capabilities of national agencies, and faced possible dissolution. In response, administrators opted for closer integration to access greater funding. This organizational equilibrium phenomenon is an important consideration for policymakers when drafting the framework for plans.

The other phenomenon precedes the operational considerations, and addresses the structure of the agreement. Despite the best efforts of scholars, administrators and policymakers, it appears that all open-ended cooperative agreements must have clear and succinct, formal bureaucratic structures. While some multilateral agreements are successful in the short-term without the development of formal bureaucratic processes, they are sustainable past this short-term lifespan. History has shown repeatedly informal cooperative agreements are highly fallible.

History points repeatedly to the International Solar Polar Mission (ISPM) to illustrate the degree to which these misunderstandings can escalate to long-term ramifications. ISPM was intended to be the first mission between National Aeronautic and Space Administration (NASA) and ESA in which the two agencies were true partners, "born to be the paradigm of ideal cooperation."[9] It was designed to place two solar probes, one from each partner, over the north and south pole of the sun simultaneously to study its third dimension. The success of the project was contingent solely on the two-probe design, and the US probe additionally was also to include a camera for imaging.[10]

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[9] R. Bonnet, & V. Manno. *International Cooperation in Space*. Cambridge, MA: Harvard Univeristy Press, 1994. pg 98.

[10] Ibid., pg 99.

Unfortunately, the volatility of the NASA budgeting process destroyed the project long before it would get close to the launching pad. When Ronald Reagan was elected President in 1981, he was forced to make budget cuts to reduce to the burgeoning deficit. NASA at the time had three large space science projects, and one had to go. "All three involved significant international participation, so NASA would have faced problems with its partners regardless of which mission it decided to cut."[11] The other two missions, Galileo, a mission to study Jupiter, and the Large Space Telescope, later renamed Hubble, would be spared the axe.

NASA unilaterally pulled out of the agreement in 1981, but only after ESA had already committed $100 million to the project.[12] The ESA subsequently felt "NASA did not share ESA's sense of obligation to international agreements."[13] Manno and Bonnet reflect the ESA's stunned realization in, the fundamental difference in the attitude between the two organizations about the sanctity of a Memorandum of Understanding (MOU). In Europe . . . the MOU was considered as legally binding on its Member States, while it became painfully clear that this was not the case for the U.S. administration.[14]

The ISPM would prove to expose the unreliability of not only the MOU format of cooperation in large projects, but also of the US bureaucratic system. In short, in the US MOU do not have the statutory authority to supercede domestic appropriation bills, while

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[11] M. Avent and M. Van Arsdall. "Global Priorities in Space: Meeting Scientific Objectives Through International Cooperation." Science and Technology in Society Conference. Washington, D.C. April 23-24, 2005.

[12] Ibid., pg 11.

[13] D. H. DeVorkin, "Solar Physics from Space." *Exploring the Unknown: Seclected Documents in the History of the U.S. Civil Space Program. Volume VI: Space and Earth Science*." Ed. J.M. Logsdon. Washington, D.C.: NASA History Office, 2004.

[14] R. Bonnet,. & V. Manno. pg 102.

in Europe, MOU are national treaties, ratified by member governments with precedence over domestic law.[15]

The unreliability of the MOUs in international space exploration can be attributed to the very law that created NASA, the 1958 National Aeronautics and Space Act. The act specified that any possibilities for cooperation required senate ratification or presidential approval. That provision was later elucidated by President Dwight D. Eisenhower, stating that, ". . . international treaties may be made in this field, and as not precluding, in appropriate cases less formal arrangements for cooperation."[16] The requisite of explicit legislative or executive approval combined with the labyrinth known as appropriations process on Capital Hill combine to make MOU a convenient, yet risky, form of cooperation. Additionally, the 1973 Defense Appropriation Act specifies that Research & Design (R&D) contracts cannot be awarded to foreign entities if the indigenous capability is present.

The importance of this assessment is significant, as a sizable amount of coordination occurs through MOU. The International Solar Polar Mission illustrates well the shortcoming. Although the cases visited later point again to the issue, the root of the problem was simply different interpretations of an informal document, and in this famous case, its binding statutory authority.

Before visiting the case studies and exploring the presence of the three factors and the fundamental trends, a thorough visit of the literature regarding multilateral cooperative agreements amongst space agencies is merited. There are several ways to

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[15] E. Sadeh. "International Space Cooperation." pg 292.

[16] United States. "Office of the Press Secretary, Statement by the President," 29 July 1958. *Exploring the Unknown, Volume II*. Ed. J. Logsdon. Washington D.C.: Government Printing Office, 1996.

study the agreements, the actors, be it supra national, national or sub-national and other conditions that affect the type and process.

CHAPTER 2
LITERATURE REVIEW

The body of literature that addresses space policy is a relatively small, and the literature focusing on cooperation, not even of the multilateral nature, is even more limited. There are, however, several seminal contributors, both theoretically and empirically, that address the specific issue of multilateral cooperation amongst space agencies. The literature reveals basically four different levels of analysis: systemic, state-level, program-level and process-oriented.

Pioneers

Scholars have been contemplating and studying cooperation in space since the dawn of the space age. Lincoln Bloomfield was one of the first scholars to publish on the subject with his 1965 article. Although the article originates from one of the iciest periods of the Cold War, it offers several important assertions that helped frame future analyses and continue to help contemporary scholars study and understand developments in the field.

Bloomfield's most important contribution lies in his establishment that the grounds for measuring cooperation in space at the very least should be tweaked and at the very most redefined.

> One must identify realistic - yet challenging – standards by which to judge the comparative success of failure of international cooperation in out space. .If we identify as the prime standard of measurement the 'internationalization' of all outer

> space activities we will have stacked the deck hopelessly – and unrealistically – against an intelligible finding.[1]

Bloomfield is pessimistic about the outlook for supranational space institutions, quoting a United Nations (UN) document calling them "inappropriate at the present time."[2] He does, however, set forth several scaled back propositions and passive measures for international cooperation. He claims, "one can legitimately ask for the creation of the appropriate international machinery to do those jobs which nations agree to delegate it and, in addition, for the optimum utilization of existing international organizational machinery."[3] Bloomfield is referring to public goods regulation, and the International Telecommunications Satellite Consortium (INTELSAT) which was created to deal with this problem.

Bloomfield also gives attention to the idea of passive cooperation, the process of agreeing to refrain from engaging in certain activities in space. He argues the issue to be a good starting point for cooperation, both terrestrially and extra-terrestrially. He points specifically to arms control, to both the testing and positioning of weapons in orbit. This particular issue is interesting in that it transcends space policy, as it is inextricably linked to Earth-bound politics.[4]

The banning of weapons and testing in space from the Test Ban Treaty and the Strategic Arms Limiting Treaty (SALT) would subsequently prove to be an interesting example of cooperation in space affairs. Superficially, the deal appeared to be a

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[1] L. Bloomfield. "Outer Space and International Cooperation" pg 608.

[2] *Report of the Ad Hoc Committee on the Peaceful Uses of Outer Space*, General Assembly document A/4141 of July 14, 1959.

[3] L. Bloomfield. "Outer Space and International Cooperation" pg 609.

[4] Ibid. pg 610.

landmark compromise of major powers forfeiting certain defense-oriented sovereign rights (weapons deployment). In reality, neither side wished to develop or deploy weapons in space, as missile technology had made this option unattractive. The deal was politically motivated, and instituted a false optimism in those hoping for the end of the arms race in the Cold War.[5]

Aside from the issue of weapons control, there are other space law issues that required attention at the time Bloomfield published his study. Liability for objects in space had become a hot topic, as had regulation of such new technologies, such as radio communication. Bloomfield hoped that if major players could be brought to the bargaining table for minor issues they might stay for larger projects. These hopes are overshadowed, however, by the importance of his first assertion, that the measures of success in space should be fundamentally different than conventional ones.

On a side note, Bloomfield's study is curiously oriented towards a heavy reliance on the United Nations (UN) for cooperative coordination. The international political dynamic of the time is an important factor in the formulation of this trust; however in retrospect it seems highly misplaced. Although many states choose to work bilaterally with the various UN agencies to accomplish various humanitarian goals, the UN is a non-factor in the development of cooperative space agreements among its member states.[6]

Systemic level analysis

Joan Johnson-Freese's 1990 book was one of the studies to offer systemic level analysis of cooperation in space. Johnson-Freese asserts two initial, important

[5] Ibid. pg 620.

[6] For a more comprehensive guide to the UN effort in space see "Space solutions for the World's Problems: How the United Nations family uses space technology for achieving development goals" V.05-82722 Austria 2005.

assumptions about the inherent nature of international cooperation, and analyzes how certain factors have affected cooperation over three, distinct epochs of the space age.[7] The first initial assertion is that there are certain areas of space activity that are inherently incompatible for cooperative ventures. She posits that areas of national security or ventures where "proprietary rights over technology may be compromised" are both unfit for cooperation. Additionally, cooperation can only occur in sectors without risk of compromising sensitive technology or the potential for cooperative frameworks dissolving into competitive environments.8 From these initial conditions, Johnson-Freese's argues that "outside the realm of technology transfer or national security, then attitude, potential benefit, and political environment are all factors affecting cooperation in space ventures."[9]

Political environment is defined as the "general conditions under which negotiations are undertaken-or not undertaken-as the case may be."10 Johnson-Freese offers the Apollo-Soyuz Test Project (ASTP) as an example of the importance of this factor. ASTP was the 1975 program between the US and United Soviet Socialist Republic (USSR) in which vehicles from both countries met in orbit and docked to make the "quarter-billion dollar handshake" between a cosmonaut and an astronaut. While the scientific results from the project were modest, if any at all, the symbolism of the project epitomized the détente policy of US-Soviet relations.

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[7] Johnson-Freese's book dates to 1990 and thus is insufficient at analyzing post-Cold War developments of the sector.

[8] J. Johnson-Freese. *Changing Patterns of International Cooperation in Space*. Malabar, FL: Orbit Book Company Inc., 1990. pg ix.

[9] Ibid. pg ix.

[10] Ibid. pg ix.

Johnson-Freese is a little more ambiguous in the definition of attitude, offering it "may be defined at either or both a macro or micro level."[11] An essential policy maker, director or legislator may all have the authority to see a project through fruition or to its demise. Additionally, entire administrations or agencies may adopt certain mindsets towards cooperation, as history has shown to be the case with NASA since its inception in 1958. Despite this ambiguity, the importance of attitude is unmistakable in development of cooperation throughout the Cold War.

The final factor present in Johnson-Freese's analysis is potential benefit, whether political, economic, scientific, or technological, with its presence given varying degrees of importance often correlated very closely with attitudes. To use the ASTP again, the political benefits were of much greater concern at that time than commercial or economic forces[12]

Johnson-Freese examines how within the three, distinct periods of cooperation these three variables "individually [were] conducive to, or an inhibitor of, cooperation." She points out two key questions in the examination she seeks to answer, "what were the motivations behind cooperative ventures, and how were cooperative ventures carried out?"[13]

Her breakdown of the three eras of international cooperation in space is quite pervasive in the literature. However, the recognition of the three eras was first proposed by the ESA director-general (DG) in reference to US-ESA relations. He put forward the

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[11] Ibid. pg x.

[12] Ibid. pg x.

[13] Ibid. pg x.

three stages being "1. the Tutorship of the United States to Europe. 2. Europe as the Junior Partner of the United States and 3. Partnership and Competition between Europe and the United States"[14] Johnson-Freese expands this characterization to space cooperation in general, a predominantly US-led endeavor.

The breakdown of the distinct periods, and the role of each factor, is important in selecting the case studies, and thus will be reserved for the respective section. Johnson-Freese does point to several important conclusions that come from the analysis. The overwhelmingly reoccurring phenomenon she finds is the obstinate inability of the US to remit its hegemony and enter into true cooperative partnerships. This trend is quite pervasive in the literature and can even be found in contemporary media reports. A few of her more important conclusions are as follows:

- "Cooperation is Not a Luxury, It is a means of Survival"
- "Cooperation in Space Should Not be Expected to Result in a Generally Improved
- Political Environment"- history indicates that cooperative agreements in the space sector have been outgrowths of friendly political relations. The failure of space agreements to indemnify relations should not be seen as failure, despite the habit of some policy makers to view agreements in such a manner.
  "International cooperation in space will occur in areas of non-national security oriented, 'low-politics' fields"
- "Subjecting space programs to an annual budget process ends up costing more money in the end and is a very inefficient process" – The annual congressional budgeting procedure has been one of the largest detriments to cooperation in space. The failure of such programs as the International Solar Polar Mission orchestrates weakness of the system. It is unlikely, however, that congress would be willing to forgo any budgeting authority (i.e. multi-year budgeting similar to the ESA process) to mitigate this problem.
- "Tying long-term goals and programs, both cooperative and national, to short-term projects will make them more palatable and sustainable" – The US has been chronically unable to develop programs in an incremental fashion, electing instead

[14] Reimar Luest. "The Cooperation of Europe and the Univted States in Space."

> to draft grand, long-term projects, almost to the point of pathology. These projects inevitably are met with criticism and downsized on Capital Hill. Johnson-Freese urges policy makers to take a more short-term, continual progress oriented program.[15]

Johnson-Freese's analysis was one of the first and most important books in multi-lateral cooperative analysis. However, her analysis fails to address the regimes and institutions formed in presence of cooperative ventures, along with the legacies of these institutions. This fundamental issue is key in the scholarship of the cooperative ventures.

Eligar Sadeh identifies this subject as one of the possible approaches to the study of cooperative agreements.[16] The literature categorizes cooperative outcomes: coordination, augmentation, interdependence and integration.[17] Their order reflects the increasing level of functional dependence, from the lowest to the highest level. The coordination outcome is characterized by independent programs that are synchronized technically and scientifically. The augmentation arrangement is "signified by functional enhancements of capabilities through contributions to a national project, which are not on the technological critical path for the mission as a whole."[18] Augmentation taken one step further results in interdependence, where technologically critical aspects of the mission are shared between or amongst partners. Finally, the highest degree of functional and symbolic cooperation is integration, the arrangement featuring pooled resources for research and development, deployment and operation.[19]

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[15] J. Johnson-Freese. *Changing Patterns of International Cooperation in Space*. Pg 113-116.

[16] E. Sadeh. "International Space Cooperation." pg 312.

[17] L. Cline & J. Rosendahl. "An Assessment of Prospects for International Cooperation on the Space Exploration Initiative." *Acta Astronuatica.* 28 (1992): 391-99.

[18] , E Sadeh. "International Space Cooperation" pg 312.

[19] Ibid., pg 312.

Table 1- Classification of International Space Cooperation Outcomes

Cooperative Agreement (year)	Outcome type
International space law regime (1967)	Coordination
INTELSAT (1971)	Integration
Apollo- Soyuz Test Project (1973)	Augmentation
European Spacelab (ESL) (1973)	Augmentation
ESA (1975)	Integration
International Solar Polar Mission (1979)	Augmentation
IACG (1981)	Coordination
Committee On Earth Observation Satellites (CEOS) 1984	Coordination
ISS (1988 and 1998)	Augmentation and Interdependence

Outside of formal institutions and regimes, states have less formal agreements they enter to guide cooperation. These agreements are Memoranda of Understanding discussed earlier. Their informality has proven a double-edged sword for space administrators and policy makers worldwide. Because they are largely informal they usually require only a minimum of legislative or executive oversight to draft and ratify. However, this can, at times, leave a great degree of ambiguity in the role of the MOU and more importantly, their statutory binding authority. Most of the first negative experiences in transnational cooperation can in some way be attributed to misunderstandings of the MOU.

Because the current state of affairs in international space cooperation is heavily dependent on the US for scientific and delivery capabilities, all players must understand the idiosyncrasies of the American system. The system is simply too complex and dynamic for a sustainable multilateral program without stable bureaucratic foundations.

Recent literature suggests an institutional backlash trend in the last few years. Scholars have recognized the enormous complications of large, technical cooperative agreements, such as those that govern the ISS development. The security and technical

problems, they argue, have rendered agreements more trouble than the results are worth. However, given the enormously expensive nature of the industry the necessity for cooperation has never been greater. Finarelli and Pryke respond to these critics by positing "exploration, in order to be sustainable, must transcend knowledge-driven activities and incorporate commercial activity with real economic returns. Thus, exploration encompasses a complex set of activities, rather than a one-shot mission or even a group of missions."[20] They suggest a coordinating body structure that is not a decision-making or governing body, but rather a forum that enables actors to communicate regularly:

> at a minimum, the exchange of information would allow the development of a consolidated international exploration roadmap that would have the purpose of helping to inform national program designs. Over time, with confidence built among potential partners, national decisions could reflect increasing interdependence among programs and infrastructure.[21]

A diagram of the proposed model is in the next page:

[20] P. Finarelli & I. Pryke. "Implementing International Cooperation in Space Exploration." *Space Policy*, 22.1 (2006): pg 24.

[21] Ibid., pg 24.

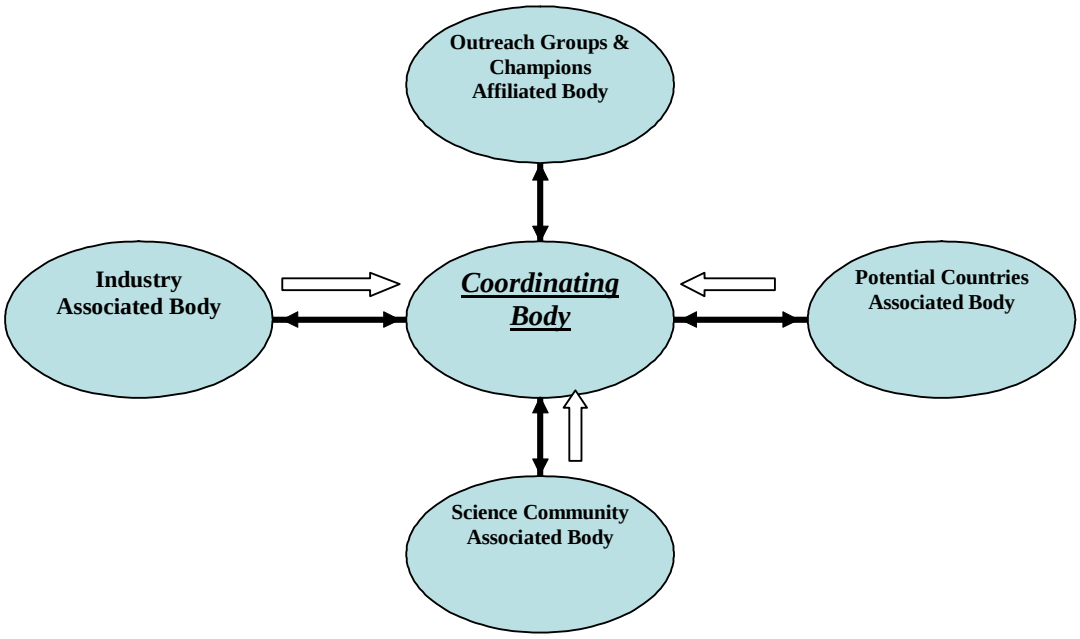

Figure 1- Structure of coordinating body. Solid arrows indicate information flows, while block arrows indicate actors that contribute to the realization of policies[22]

Although the program appears to be a legitimate model, practice seems to indicate that this format is very difficult to sustain for the long-term, if not impossible. This is very similar to the format initially drafted for the IACG. Although the details of the study are reserved for later, programs of this nature have shown themselves to be quite fallible.

Loyalty transference is one last important systemic variable that deserves mention. Loyalty transference is a key theme in integrative literature. Juliet Lodge asserts that "if an organization provides for a given welfare need, then this will automatically register in the consciousness of the beneficiaries."[23] Loyalty transference is an important mitigating factor to the centrifugal nationalist forces. Its presence is far more observable in

[22] Ibid., pg 24.

[23] J. Lodge. "Loyalty and the EEC: the Limits of the Functionalist Approach." *Political Studies.* 26.2 (1978): pg 232-248.

institutional settings, such as the ESA, as its facilitation requires sustained, long-term cooperation. This is not to say less formal agreements cannot facilitate the loyalty transference process. No attempt to measure loyalty transference outside of the ESA case has been observed in the literature, although its important in both theoretical and empirical literature is unmistakable.

State level analysis

Several scholars have directed their study of international cooperation to state level factors that influence cooperation. These studies analyze how national factors like functional and political preferences, foreign policy, and other policies are realized in space cooperation. Typically these works conclude with policy suggestions and prescriptions.

Historical perspectives indicate the importance of this approach. "Space politics is one of coalition building that involves a plurality of political actors that include the President, Congress, the space bureaucracy, advocacy coalitions, and commercial enterprises."[24] Politics and the highly symbolic space industry have long been recognized as inseparable. Carl Sagan, one of the great ambassadors for the space, defined this perfectly: "Governments do not spend vast sums just for science, or merely to explore. They need another purpose, and it must make real political sense."[25]

With this in mind, state-level analysis offers a ray of opportunity in explaining cooperation. One approach to the state level of analysis features "how political actors

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[24] E. Sadeh. Introduction. *Space Politics and Policy: An Evolutionary Perspective*. Ed. E. Sadeh. Norwell, MA: Kluwer Academic Publishing, 2002. pg xvi.

[25] C. Sagan. *Pale Blue Dot: A Vision of the Human Future in Space*. New York, NY: Random House Inc., 1994.

cooperate to realize their policy preferences."[26] This approach characterizes two types of preferences, symbolic and functional, that drive actors towards cooperation. The symbolic preferences are those driven by politics, both foreign and domestic, and include concerns such as "prestige, propaganda, policy legitimization, enhanced policy influence over other actors, international accountability, [and] world leadership."[27] Functional preferences can be scientific, technological or economic in nature. The scientific and technological aspects are simply two sides of the same coin, both pressures for enhanced progress in the field of research and development. Economic functional pressures, however, can "include maximizing national economic benefits, promoting industrial autonomy, enhancing economic competitiveness and realizing economic savings through cost-burden sharing with other political actors."[28] Whatever compromise of these pressures arrives out of the national bureaucratic machinery can then pursue the appropriate cooperative effort internationally.

This approach is especially helpful in the analysis of the programs and policies of actors new to the space sector, such as China. "First and foremost, Chinese space activities are part of Beijing's overall economic development program. Success in space is a highly visible demonstration that China can produce more than cheap sneakers and faux designer clothing."[29] The technological infrastructure is important for Chinese long-term goals; however, it is also part of a new phenomenon called techno-nationalism.

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[26] E. Sadeh. "International Space Cooperation" pg 309.

[27] Ibid., pg 315.

[28] Ibid., pg 315.

[29] J. Johnson-Freese and A.S. Erickson. "The Emerging China-EU Space Partnership: A Geotechnical Balancer." pg 12.

Although the discussion of this type of nationalism is reserved for later, its existence is driving the Chinese manned space program. It serves little purpose other than national prestige.[30] Additionally, these policy preferences are driving large projects like the Galileo positioning system, the European, and now world-wide response to the dependence on the GPS.

Pasco and Jourdain offer a comparative space program study, an interesting twist in the state-level analysis.[31] The comparative analysis looks into some of the ideological and rhetorical trends, their institutionalized progeny, and how both affect cooperation in the US, French and ESA space programs. They find that there are, in fact, a number of "myths" that are quite pervasive in the space sector, especially the public arena. The most prominent myth is that of the so-called Golden Age, an outgrowth of the Apollo program legacy[32] and the unique historical and political circumstances linked to the Cold War. This myth is typified by a unified space policy agenda, and in particular, the necessity of "large-scale manned orbital complexes."[33] The resulting breakdown of this myth following the end of the Cold War yielded talk of a 'crisis in space' and "such 'crises' rhetoric has been institutionalized through the mobilization of expert committees, ad-hoc commissions, and consulting firms."[34]

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[30] Ibid., pg 12.

[31] L. Jourdain, L. & X. Pasco, X. "Comparative Space Policy: The Space Policy Crisis in the American, European and French Space Programs." *Space Politics and Policy: An Evolutionary Perspective.* Ed. E. Sadeh. Norwell, MA: Kluwer Academic Publishing. pg 317-334.

[32] The Apollo legacy refers to the 1960s when NASA budgets were large as 7% of federal spending, scientists and engineers had access all available resources necessary, and these large-scale projects were administered from the top-down successfully.

[33] Jourdain, Laurence and Pasco, Xavier. (2002). Comparative Space Policy: The Space Policy Crisis in the American, European and French Space Programs. Pg 318.

[34] Ibid., pg 317-318.

Pasco and Jourdain also provide several keen insights into the American and European public and private space sectors. The American program was created in the shadow of the Sputnik-1 launch, and, while previous programs were designed to link military and civilian development, NASA, as created by the Space Act, was a distinctively military, and not civilian, institution. "The creation of NASA as an executive agency reinforced the legitimacy of an omnipotent federal state that foreclosed opportunities for local powers and the private sector."[35] While the Department of Defense (DOD) maintains its own top-secret space program, NASA activities have been inextricably linked to national interest and more importantly national security. The authors claim that this ideological dependency has left NASA "unable to make the intrinsic worth of space exploration and utilization its fundamental reason to exist."[36] As a result, NASA is subject to changes in US foreign and domestic policy, and hence has stifled its exploratory, scientific and industrial development and autonomy. Finally, the authors claim that the Apollo legacy has left NASA with a bureaucratically dependent, top-down approach that favors large projects rather than small, incremental progress.

The European program, both nationally and supra-nationally, was born out of much different circumstances, a fact reflected in several fundamental differences from the American program. First, Europe benefited from the ability to observe the American model of space exploration, and realized quickly they had neither the capabilities nor the desire to enter into the manned space race. Instead, the European model features a strong emphasis on technological development and autonomy, a lesson learned from both the

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[35] Ibid., pg 318.

[36] Ibid., pg 321.

industrial benefits and the unreliability of their American counterparts. "Europe lacked the sustained 'national security' ideological values and norms adopted as an identification factor to unify the space community in the US, [and] European space policy has developed in a more piecemeal fashion."37 There are, however, some very strong nationalist forces within the ESA community, mainly in the French space program, to be visited later.

Finally, the authors cite two main divergent trends that have appeared in the public and private space sectors. The first trend is that of the Utilitarian Doctrine. Pasco and Jourdain define this in stating, "the declining 'exploration' values traditionally associated with the rise of the space age provoked a refocuses attention to more practical considerations, through the adoption of what could be called a 'space utilitarian' doctrine."38 While NASA's Apollo legacy, much like their Russian colleagues, contradicts this utilitarian modus operandi significantly, the organization is moving towards the utilitarian side of the space sector operation.

The European sector, however, has a strong tradition of utilitarianism, and is instead struggling to develop the other trend, the Exploration Ethos. This trend is driven by the desire to explore simply by its intrinsic merit, the continuing legacy of decades of terrestrial geographic exploration. The unfortunate flip-side to the security-oriented approach of the US is the absence of this ideal. "For some US congressional representatives, human spaceflight is a symbolic kind of achievement with little utility

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[37] Ibid., pg 322.

[38] Ibid., pg 331-332.

and commercial pay-offs."[39] In an effort to mitigate those working against exploration programs administrators have turned to multilateral cooperation as a means of cementing support domestically. History has shown this to be both ineffective and detrimental to the reputation of the US.

A brief illustration of the exploration ethos is found in the European Center for Nuclear Studies (CERN), an institute dedicated to the study of high energy physics, illustrates this issue. The research CERN conducts requires large sums of capital and is without industrial application. While CERN is funded by member states in Europe, the lack of applicability allows the institution to go without any kind of geographic return policy its encumbering politics. The funding to CERN is acknowledged as worthy in its intrinsic merit, and does not require bargaining and other agreements for its continued existence.[40]

Policy-Level Analysis

A more narrow approach to cooperative analysis approaches individual policies. Many scholars have found certain policies to be much more effective at either stimulating or stifling cooperation. This analysis is much more empirical than theoretical, yet it does help in the process of policy prescription.

Historical patterns of international cooperation reveal the primacy of the US program. Thus, an overview of NASA policy preferences offers a good starting point for a more general policy analysis. Sadeh gives four guidelines NASA requires before entering into cooperative agreements:

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[39] Ibid., pg 332.

[40] R. Bonnet & V. Manno. *International Cooperation in Space*. pg 58-59.

1. Clearly defined and independent managerial interfaces that ensure NASA's dominance in political authority and decision making.

2. No exchange of funds in which each partner is financially responsible for project elements it develops.

3. Distinct technical responsibilities that retain NASA's control of critical path items and over system integration.

4. Protection of sensitive technology where arrangements for cooperative projects protect against the unwarranted transfer of technology abroad and maintain technologies critical to NASA to ensure the industrial and economic competitiveness of the US.[41]

At the policy level, cooperative agreements appear much less as the symbolic union, and much more as commercial, contractual agreement. The NASA relationship with the Russian agency is characterized most often in this form, with RKA functioning as a contractor rather than as a partner.

No example better epitomizes this than the development of the Hubble Space Telescope (HST). During the telescope's development scientists discovered that the solar panels were susceptible to atomic oxygen damage and certain precautions were necessary to guarantee their proper function. When the MOU was signed the discovery of the malignancy of atomic oxygen had not been made, and thus was not anticipated in any of the arrangements. NASA administrators insisted ESA officials, the manufacturers of the panels, be financially responsible for the modifications. ESA officials argued if the MOU were truly a cooperative agreement the US, clearly the dominant partner, would pay for the modifications. In the end the ESA got stuck with the bill to change to the panels, a clear reflection of both the primacy of NASA and the nature of the program as contractual, not cooperative. Johnson-Freese adds, "This situation illustrates an

[41] E. Sadeh. "International Space Cooperation." pg 289.

important and increasingly recurring issue: that of the grey area between cooperation and a business relationship, which is sometimes left deliberately ambiguous."[42]

NASA is in fact entering a new age of cooperation with outlining of President George W. Bush's Vision for Space Exploration plan. Avnet and Van Arsdall explore the new dimensions of the new plan, and formulated several important characteristics new cooperative plans should encompass, rather than offering guidelines for one specific agency. Each, they claim, are critical to ensure that scientific objectives are satisfied while still offering the ability of individual participants to set their own agenda. They are reproduced below:

- Mutually beneficial to all parties involved
- Visibility in decision-making and budget allocation to the extent practicable
- Common understanding on the binding power of the agreement
- Common understanding on the issues that can lead to delays or cancellations
- All parties have a sense of autonomy
- Flexibility to respond to changing scientific or political situations
- Avoid duplication while embrace complementarity
- Cooperation occurs at the mission level when possible and is encouraged among scientists at the investigation level
- Bilateral when possible[43]

Avnet and Van Arsdall highlight the utility of bilateral agreements. It is important to recognize, and as the study will reveal, that multilateral agreements are not easy nor necessarily good paradigms for cooperation. Only the most ambitious or pervasive

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[42] J. Johnson-Freese. *Changing Patterns of International Cooperation in Space*. Pg 54.

[43] M. Avent and M. Van Arsdall,. "Global Priorities in Space: Meeting Scientific Objectives Through International Cooperation." pg 19-20.

projects merit the complexity of multilateral agreements. Before approaching the question of how to do them effectively, one must ask when they are appropriate. The success of a program is, "contingent upon the ability of states to forge an appropriate vehicle for international cooperation."[44] The relative scarcity of multilateral ventures vis-à-vis bilateral speaks enough to answer this question. Additionally, entering agreements when not appropriate or without the necessary commitment can in fact hinder, rather than contribute, to progress in the long-term.

A slightly different approach to the same level of analysis features policy recommendations that have been effective in other fields, and may be function as mechanisms to jump-start the process. In 1996, the American Institute of Aeronautics and Astronautics (AIAA) met to discuss possibilities for cooperation in this manner. The report subsequently published identified five areas with potential.

1. Global space systems services
2. International cooperation for peace-keeping
3. Cooperative human and robotic exploration of space
4. International cooperation in space transportation
5. Solar power to Earth[45]

Of those five, one has already facilitated cooperation, the global space systems network. The other four seem to have failed to deliver great cooperative arrangements in the decade following the conference. These hopes, like those of many other internationalist policymakers and scientists, have proven themselves to be little more than

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[44] J. P Lester, E. Sadeh. & W.Z. Sadeh. "Modeling International Cooperation for Space Exploration." *Space Policy*. 12.3 (1996): pg 212.

[45] R. A. Fuhrman & J. Wild. "International Cooperation – How to Proceed." *Space Policy*. 12.2 (1996): pg 143.

pipedreams. History and the literature point that cooperation has almost always been a vehicle of pragmatism

Process-Oriented Analysis

The final approach for cooperative space analysis features the process, or rather the dynamics between epistemic communities, policy makers and initial conditions and seeks to explain which channels of bargaining lead to outcomes and why. Sadeh, Lester and Sadeh seek to investigate this process. The fundamental questions identified in their study are (1) who are the key actors in decision-making (2) what are the processes they engage in and (3) how do the "actors and processes interact in enabling/constraining international cooperation."[46]

The initial conditions refer to how economic, political, and scientific and technological factors present constrain or enable actors' options for cooperation. Political conditions encompass sub-national, national and supranational players that interact amongst themselves. This "interaction allows for 'constantly dynamic' patterns of autonomy and authority," or there is a specific power hierarchy contingent upon a specific scenario or policy preference.[47] This also includes systemic attitudes, such as détente or the end of the Cold War, where preference ordering may change over short periods of time. The economics condition refers to different entities at different levels. At the state level economics refers to budgetary appropriations and other funding avenues. At the sub-national level it refers to industrial return. This variable is also

[46] J.P. Lester, E. Sadeh. & W.Z. Sadeh. "Modeling International Cooperation for Space Exploration" pg 207.

[47] Ibid., pg 210.

closely related to the scientific and technological conditions, as the three are usually very closely correlated in the space sector.

The authors define the political actors by including, "those individuals, groups, states or organization that can in one way or another engender cooperative outcomes."[48] The most prominent players in the space sector are the national space agencies and their respective governments. Behind the agencies, epistemic communities are named to be the second most influential entity.[49] International organizations are named as the third actor influencing policy outcomes.[50] All of the actors engage in constant cross-level communication and cooperation.

The study develops four models of cooperation through which the interactions among the different actor entities and the initial conditions are captured as policy outcomes.[51] The four models are:

1. Institutional bargaining incorporating negotiating processes among functional and technological oriented institutions
2. Epistemic community process as it relates to the cooperative decision-making role that knowledge-based communities of scientists play.
3. Structural conditioning in terms of realist orientation dealing with hegemonic stability, state power asymmetries and cost/benefit calculations.
4. Convergence of norms based on the emergence of compatible preference-orderings between self-interested state actors.

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[48] Ibid., pg 210.

[49] An epistemic community is a transnational, knowledge-based group with a recognized authority in a particular technical or scientific field that advises policymakers.

[50] The order does not reflect their importance; each plays a vital role in cooperation.

[51] J.P. Lester, E. Sadeh & W.Z. Sadeh. "Modeling International Cooperation for Space Exploration."

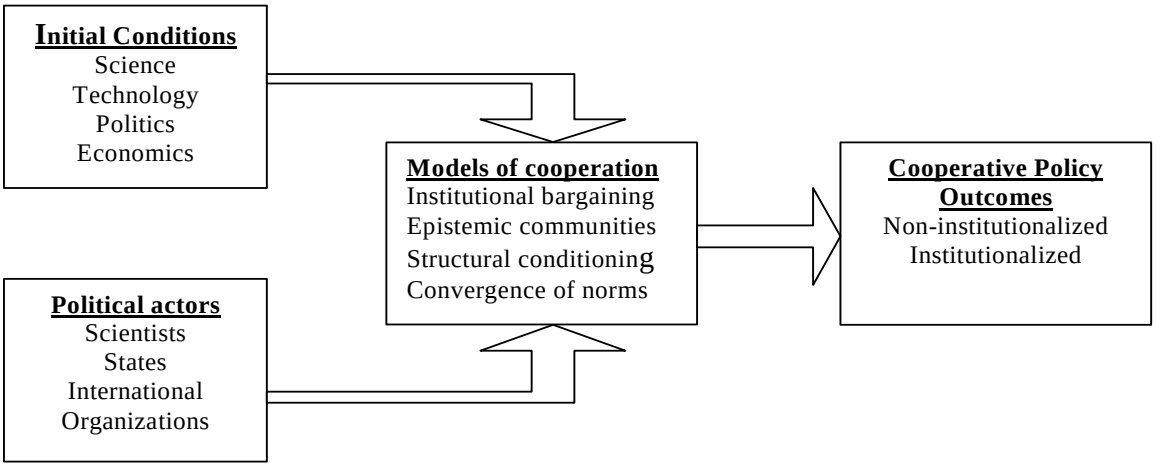

Figure 2 The Sadeh, Lester and Sadeh model of the dynamics of international cooperation.[52]

The institutional bargaining model features the creation and operation of international organizations. Institutions have distinctive functions that greatly increased the probability for cooperative outcomes. "These include: (1) promoting state concern to a particular issue area; (2) enhancing national policy and administrative state capacities as it relates to making and keeping international agreements; and (3) framing an international legal environment for cooperative agreements."[53] The stability offered by this model is the most appropriate to accommodate changes in the international political community or incentives for cooperation that may be upset by technological or scientific innovations.

[52] Ibid., pg 208.

[53] Ibid., pg 210.

Epistemic community cooperative processes refer to information sharing that occurs among groups that have relatively analogous scientific beliefs and goals.[54] These communities generate norms and standard operating procedures that become heighten both cooperative agreements and the receptive attitudes towards them i.e. regimes. Space science is particularly well suited to the influence of epistemic communities "due to its powerful scientific context resulting in the partial acquiescence of decision-makers to scientific elites in the policy process."[55]

Structural conditioning and convergence of norms are similar in that they are reflections of changing preference ordering among actors. There is one key difference, however: the role of power politics. Structural conditioning features the policy decisions of a hegemon, and the systemic incentives to cooperate with, or at the very least adjust to, the new framework. This approach relies heavily on conventional power asymmetries and their ramifications. Convergence of norms is the coincidental junction of "preference orderings emanating from pressures generated in the domestic and international policy milieus."[56] This approach is much more subtle, and is usually the result of cost/benefit analysis by key actors.

Through the selection of several case studies, the Sadeh, Lester and Sadeh seek to test several hypotheses generated from their model. The first hypothesis tested the institutional bargaining model, positing that when cost/benefit analysis was favorable and epistemic communities were active politically, institutional arrangements were expected.

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[54] Haas, P. M. "Epistemic Communities and International Policy Coordination." *International Organization*. 46.1 (1992): pg 3.

[55] J.P. Lester, E. Sadeh & W.Z. Sadeh. "Modeling International Cooperation for Space Exploration." pg 211.

[56] Ibid., pg 212.

The role of epistemic communities in the institutional formation process is paramount, and the institution, the ESA, has been so successful it functions as its own political entity.

The second hypothesis contends that when scientific and technological benefits supersede political and economic concerns, epistemic communities will be the most important actors in the decision making process. While the epistemic communities are removed from the policy-making positions in other decision processes, when the conditions specified are present, the communities become the dominant policy makers.

The third hypothesis refers to the emergence of structural conditioning within cooperative systems of asymmetrical power. The authors found that when these power asymmetries occur, the other factors, both initial conditions and the different actors, become irrelevant in the bargaining process. The authors cite the ESL, ISPM and ISS programs as examples of this cooperative arrangement.

The fourth hypothesis is that when relative power balances exist and politics becomes the most important initial condition, the convergence of norms arrangement will emerge. The importance of political symbolism in this arrangement cannot be stressed enough, as cooperative agreements are much more often pragmatic ventures than symbolic endeavors.[57]

The study sheds a great deal of light on the process of bargaining, and how certain arrangements emerge from their respective international environments. However, the hypotheses seem less to be questions driving research, and instead the forgone conclusions restated as questions. Aside from this shortcoming, the Sadeh, Lester and

[57] Ibid., pg 221.

Sadeh do offer one of the most revealing works on the dynamics of international cooperation in space.

Conclusion

The recognition of these four approaches to the issue of cooperative space ventures from these four perspectives. Each approach offers insights that may compound with the findings of other approaches, or simply recognize factors not account for in other approaches.

Several trends noticeably appear repeatedly in the literature. The first is the role of epistemic communities. As mentioned previously, the space sector is particularly well-suited for epistemic community influence given its highly technical nature and the subsequent reliance of policy makers on these communities for information. Paradoxically, the space industry is also largely a politics-driven sector, whether guided explicitly or implicitly by political channels. It is, by and large, not driven by scientific benevolence or idealist principles, but rather by pragmatic concerns. Thus the influence of the epistemic communities over policy occurs only to the apathy of the conventional political players.

Finally, there are a very limited number of cases scholars can test hypotheses relating to international cooperative agreements. The space industry is approaching the 50th anniversary of Sputnik in 2007, and while the future seems opportune for the drafting of yet conceived agreements, at present there are only a handful of multilateral cases available to study. Despite this fact, there are still research approaches that are still unexplored, a testament to the relatively little scholarly attention given to the subject.

CHAPTER 3
METHODOLOGY AND CASE SELECTION

There are three case studies that will be analyzed for this examination. Each of three cases have been selected by the merit that all were drafted as open-ended, multilateral agreements: "Management of open-ended projects may well be the hardest and most contentious point of future cooperation."[1] With this in mind, there are key, fundamental differences among the cases that are specific to each. The study of these cases will combine several of the levels of analysis in case selection and the investigation. The selection process has been made according to supra-national considerations, while the exploration of the studies will look for program specific qualities.

The three cases for the study are the Interagency Consultative Group (IACG), the International Space Station (ISS), and the European Space Agency (ESA). The cases encompass four types of cooperative agreements as listed by Sadeh: integration, augmentation, interdependence and coordination. In addition to their different structure they also address fundamentally different aspects of space exploration, from a highly politicized ISS to a purely scientific IACG.

The three studies date to the last two eras in Johnson-Freese's work. The second phase she details, 1970-1984, saw the emergence of players with genuine space capability, and greater receptivity of NASA to relinquishing responsibility reflects this

[1] J. Johnson-Freese. *Changing Patterns of International Cooperation in Space*. Pg 53.

change. The ESA and IACG date to this era. The third era, 1985-present, has seen the development of agreements that are much closer to true cooperative arrangement rather than contractual agreements as suggested by the literature. NASA has at times found the readjustment quite painful, "once you have the whole pie it's difficult to adjust to less."[2] The ISS dates from this program.

The analysis borrows Johnson-Freese's comparative factor approach, but with slight modification. While Johnson-Freese's study focuses on the presence of attitude, potential benefit and political environment and their affect on coordination efforts of actors, she chooses to avoid analyzing national interest and potential technological transfers, claiming to look outside the realm of both. To neglect these important variables undermines the conclusions of any research. This study analyzes how the nationalist factors, including security concerns, nationalism and technology transfer, along with bureaucratic factors and economic factors are accounted for within the cooperative agreements.

Nationalist Factors

Nationalist forces are defined as the centrifugal forces that affect cooperation due to the inherent threats to security, competition or nationalism of space cooperation. There are several ways it can affect agreements. Beyond conventional security concerns, there are two technologically oriented phenomena: (1) techno-nationalism and (2) techno-protectionism.[3]

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[2] Ibid., Pg 56.

[3] J. Johnson-Freese & A.S. Erickson. "The Emerging China-EU Space Partnership: A Geotechnical Balancer." pg 14.

The security concerns of space development are fairly straight-forward. In addition to the development of powerful and reliable rockets and missiles, space research involves other dual-use technologies like lasers, computers, polymers and radioactive materials. Military powers such as the US and Russia are very careful to mitigate the proliferation of such technology.

Techno-protectionism is as old as the space industry itself; its perpetual presence is felt at the bargaining table. Techno-nationalism, however, is a newer phenomenon, not to be mistaken with the former. "Developing powers such as China…tend to take an especially nationalistic approach to technological development, perhaps because their leading elites are acutely conscious of the costs of exclusion from economic and military world leadership."[4] The recent rapid development of a manned space program in China has been accredited to techno-nationalism. Techno-nationalism encourages actors to "engage in techno-nationalist realpolitik"[5] A Project like the global position network Galileo, initially pioneered by the ESA and now being developed through several international partnerships as well, provides another example of this trend. Techno-protectionism on the other hand is a much older and pervasive trend. It is simply the desire of states to keep what they have away from the have-nots. It usually serves to either guard military technology or protect competitive advantage.

It is possible that certain idiosyncrasies of national identity can affect cooperative efforts as well. The desire for national technological autonomy, independence or prestige can keep key actors away from the bargaining table. The French experience offers the

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[4] Ibid., pg 14.

[5] Ibid., pg 15.

best example of this, as they have insisted from a very early stage the importance of independent access to space. As a result, the Ariane program has been pioneered by spearheaded by their national agency, *Centre National d'Etudes Spatiales* (CNES).

Bureaucratic Factors

The bureaucratic factors variable analyzes how the cooperative framework, whether it is as informal as a MOU or formal as an institutional design, distributes authority, managerial interfaces and decision making processes among scientists, administrators and public officials.[6] The authority structures within the bureaucracy are much more important than one may think, as often policy is not delivered top down, but rather, "bureaucrats within these strong and independent bureaucracies frequently initiate space policies."[7]

Trying to coordinate several independent bureaucracies is a significant endeavor. The framework must encourage bureaucrats to surrender some degree of decisional autonomy within context of an appropriate managerial interface. The result often relinquishes power to officials exogenous of the bureau, "the difficulty of conducting space ventures . . . has served to deliver substantial amounts of policy making into the hands of professional bureaucrats working within the executive branch of government."[8]

Despite the impressive challenges, success has been achieved. In each example specific provisions are required to cater to idiosyncratic bureaucratic procedures, program requirements, or one of the nationalist or economic factors. Additionally, "as formidable

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[6] E. Sadeh. "International Space Cooperation." Pg 310.

[7] McCurdy, H. E. (2002). "Bureaucracy and the Space Program." *Space Politics and Policy: An Evolutionary Perspective.* Ed. E. Sadeh. Norwell, MA: Kluwer Academic Publishing. pg 107.

[8] Ibid., pg 116.

as they are, the challenges of space policy formulation can appear trivial compared to the difficulty of making the policies *work*."[9] (Emphasis added) Programs that failed to develop proper framework to administer decision-making and other processes fail as the cases will illustrate.

Economic Factors

The economic factors variable refers to the funding and investment of programs, or more generally, how money comes into the program and where it leaves. Its manifestation is apparent in several vehicles: industrial return, exchange of funds and private financing to name a few. The finance side of issue refers to the differing degrees to which public, private and commercial players assume financial responsibility in a program. Opposite this are the procurement aspects of an agreement and how each member receives a fair return investment. Pragmatism, not altruism, drives international cooperation in the space sector, and economic concerns are very important to the sustainability of long-term projects. Without appropriate channels governing finance and investment, irreparable conflict is inevitable.

Conclusion

As the case studies will show, each of the factors are represented in some way; however, the inherent nature of the activity and the cooperative agreement determine each of the factors' respective importance in either inhibiting or promoting cooperation. Within the analysis of the variables, the general trends, outlined previously, persistently present themselves not as variables, but as fundamental characteristics of the system in

[9] Ibid., pg 117.

which actors negotiate and coordinate. The ESA case study will be first, followed by the IACG, and the ISS case.

CHAPTER 4
THE EUROPEAN SPACE AGENCY

For 40 years, Europe has managed successful and very profitable cooperation inside the framework of its institutions, initially European Space Research Organization (ESRO) and European Launcher Development Organization (ELDO) and later in the alloy of the two, the European Space Agency (ESA). Although the level of public expenditure in the space industry in Europe is significantly less than the US, €15 a person to €110 a person in the US, the industry is among the world's most innovative and competitive.[1] The process has been uniquely cooperative, "ESA, Member States and their national space agencies, research centres, together with industry, all deserve the credit for having established Europe as a key player in space."[2]

A more comprehensive investigation, one that probes the ESA's unique history, complex bureaucratic structure and commercial framework, reveals the degree to which the agency is truly phenomenal. The agency's delicate balance between coalescent and centrifugal forces has bestowed the continent 40 years of truly multilateral cooperation in the space sciences. More importantly, "at the same time, they have deserted neither their own domestic programs nor their bilateral or multilateral cooperative agreements with other agencies in Europe or elsewhere in the world."[3] Additionally, the cooperation has

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[1] European Commission. *Green Paper – European Space Policy.* Luxembourg: Office for Official Publications of the European Communities, 2003. pg 12.

[2] European Commission. *White Paper – Space: A New European Frontier for an Expanding Union.* Luxembourg: Office for Official Publications of the European Communities, 2003. pg 7.

[3] R. Bonnet & V. Manno. *International Cooperation in Space*. Pg 1.

occurred with unsurpassed efficiency: ESA has never cancelled a project and rarely runs over budget.[4]

The importance of the agency for this study lies in its ability to successfully address and each factor determined to affect international cooperation in space. Be it by the profound foresight of the drafters of the ESA convention, or simple good fortune, the agency certainly offers one promising model for cooperation in institutional form. Each factor has developed its own unique solutions, both *a priori* and *a posteriori*, and thus serves as an excellent starting point for the study.

Historical Context

The ESA was born in 1975 from the merger of two space oriented research institutions, ESRO and ELDO. ESRO was intended to "further the training of European specialists in space technology, promote the exchange of scientific and technical information, and provide national research groups with launching facilities."[5]

The organization's future successes stem from its founder's "absolute desire to define ESRO as a purely scientific research organization, free as possible from detailed government interference."[6] In fact, the ESA is still runs with this principle as its primary mission. In order to preserve its scientific sanctity, ESRO would have to forego research into delivery vehicle development, technology with a very clear military application. ESRO was created with a comprehensive, yet effective, bureaucratic oversight procedure. Strict budgetary procedures were instituted to protect national scientific autonomy,

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[4] Ibid., pg 26.

[5] L. Bloomfield. "Outer Space and International Cooperation." pg 618.

[6] R. Bonnet & V. Manno. *International Cooperation in Space*. Pg 5.

particularly a budget ceiling. Decisions regarding commercial and industrial contracts are made by the executive, and capital is reinvested in accordance with the percentage of contribution, a procedure known as j*uste retour.* The facilities were distributed amongst the member states, but still operated until a strong central authority, the governing council with a strong director position.

A different organization, ELDO, was created with this task, to develop a European launcher. The scientific launcher program was born out of its military counterparts, and the distribution of facilities active in the program reflects this quality: they were located largely in France and the UK. The bureaucratic authority was substantially more vague than that of ESRO, as the Director General weakly coordinated the efforts of individual member states and contracting responsibility fell outside of the executive's jurisdiction.[7]

The first project ELDO engaged illustrated quite clearly the shortcomings of the organization. Aiming specifically to create a space-vehicle launcher capable of delivering payloads, the *Europa I* program was created to put a small satellite into a geostationary orbit by 1966.[8] The rocket was constructed from a collage of missiles stages and hardware from a half-dozen members.[9] The program managed to produce one failed launch at triple the cost of the initial £70 million estimate.[10] A decade later, under the direction of the ESA, the coordination flaw was remedied by appropriating launch responsibility to a single organization. The French space agency CNES was largely responsible for the development of the successful commercial launcher program Ariane.

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[7] Ibid., pg 13.

[8] L. Bloomfield. "Outer Space and International Cooperation." pg 618.

[9] Ibid., pg 618.

[10] R. Bonnet & V. Manno. *International Cooperation in Space*. Pg 13.

Bonnet and Manno juxtapose the two organizations and the lesson of each:

> Why did ELDO fail in comparison with ESRO? ESRO provided facilities and services to the European scientific community. Its program was kept as much as possible free of political interference, being defined, reviewed and used by the scientists themselves, but being managed though the Agency. On the contrary, ELDO, placed directly under the auspices of its Member States, was deprived of any central management capability. The example of ELDO must be remembered in the future when setting up other research and development organizations of a multinational character.[11]

The ESA was not created until several years later, however. It would take a crisis within ESRO to forge the two organizations into the institution present today. The pressure came from two major factors, both born out ESRO's success. The first of two was the inability to "establish proper technical and financial definitions of the first two large satellites of its program."[12] The organization's immaturity fostered a very high and very unrealistic level of ambition. Unfortunately, the ESRO drawing board produced programs that were far beyond the capacity of the still infant organization, this at a time when even moderate programs typically exceeded their budget.[13]

The second factor was the organization's insistence to remain unrealistically scientific. Critics charged the organization as returning little science in an expensive cooperative effort that typically ran over budgeted and off schedule, while the opportunities for commercial development remained unrealized.

The call for a "single coordinated space policy, incorporating science as well as application programs" was answered in 1975.[14] The ESA was drafted over a series of

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[11] Ibid., pg 14.

[12] Ibid., pg 16.

[13] Ibid., pg 16.

[14] Ibid., pg 16-17.

three conventions in ten years. The initial objective was to "bring together the necessary resources and skills required for developing an integrated space science programme and producing a European launcher."[15] Although there have been some changes, the organization still closely resembles its original format.

Nationalist Factors

As mentioned previously, the 1957 launch of Sputnik I heralded a new age for mankind. It became evident to European leaders very early in this new age that the rules and strategies had changed significantly for the final frontier. No European state is "capable of maintaining a space policy at the necessary level," much less compete amongst the other two space superpowers, the US and USSR, in an industry where the price tag was at times was as large as the vast expanses it explored.[16] In 1965, 7.5% of the US national budget was appropriated to space activities; surely Europe would fall behind without a joint effort.[17] A European cooperative venture would "allow Europe to speak with on voice in the two leading space powers and at the same time build a competitive space program." It would also to prevent an exodus of Europe's finest aerospace scientists and engineers to the US that would certainly occur in the absence of competitive industry.[18]

In the face of the grim outlook of uncooperative policy, officials recognized not only the importance but the necessity of cooperation. This realization was further

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[15] European Commission. Green Paper – European Space Policy. pg 10.

[16] Ibid., pg 6.

[17] L. Bloomfield. "Outer Space and International Cooperation.
pg 603.

[18] R. Bonnet & V. Manno. *International Cooperation in Space*. pg 3.

compounded by the desire to reinvigorate Europe's still stagnant aerospace industry, and the general economic reconstruction following World War II.[19] In short, it unequivocally served each state's national interest to pool resources. The decision to pool resources is very uncommon, and leaves the ESA in an interesting position for this study. The techno-protectionist concerns become irrelevant, and instead, the focus is turned to the sovereignty and security concerns of members.

The framers of ESRO, with WWII a fresh memory, were very keen to mitigate the nationalist reservations that delegates harbored, the legacy of which endures into the ESA convention. Several important fundamental policies ensure individual members retain a degree of national autonomy while still promising that which would be unobtainable at the national level. This was necessary to prevent both major crises from emerging or the gradual dissolution of the agency.

Central to the ESA's cooperative effort was the strict "science only" policy, refraining from the development of any military-use technology. The mandatory program was for the pursuit of purely scientific research, and the optional programs for peaceful space application. Although today's ESA has developed a little flexibility on the issue,[20] initially this was one of the most sacred standards of the organization.[21]

The second fundamental dictates geographic distribution, one of the more prominent themes of ESRO that has survived today. "This was the first occasion when the concept of geographic distribution was tacitly recognized as one of the key rules of

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[19] European Commission. White Paper – Space: A New European Frontier for an Expanding Union. pg 9.

[20] The ratio of public civil to defense expenditure in 2003 was approximately 1:5. US expenditure, in perspective, is roughly balanced 1:1. *Green Paper – European Space Policy* (2003) pg 12.

[21] European Commission. *Green Paper – European Space Policy*. pg 20-21.

the future organization."[22] The tension over geographic location was apparent very early in the drafting process. Initially the headquarters and research center were proposed to be closely located to streamline the coordination efforts of the main administrative and scientific establishments. This idea was rejected on the grounds that it would give one member too large of a strategic advantage.[23] Instead the institutions are located as follows: The European Space Research and Technology Centre (ESRTC), "the design hub for most ESA spacecraft and technology development" is situated in Noordwijk, the Netherlands. The European Space Operations Centre (ESOC), the European mission control, is in Germany, as is the European Astronauts Centre (EAC). The ESA Earth Observation Centre, ERSIN, is based in Frascati, Italy, near Rome.[24] Finally, the ESA headquarters is Paris, France, the legacy of its ESRO predecessor, selected for its proximity to the ELDO headquarters already established there.[25] Geographic distribution concerns not only facilities, but also employees. Although there is no official policy on the distribution of employees, the nationalities are kept roughly commensurate with the percentage of total contribution to the ESA budget.

The most important characteristic of the ESA framework is the unique ability of states to function on both a national and supranational level. The unique arrangement allows supranational participation while still offering the autonomy to engage in national programs and other cooperative agreements. Many member states retain very active

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[22] R. Bonnet & V. Manno. *International Cooperation in Space.* pg 8.

[23] Ibid., pg 8.

[24] European Space Agency. "ESA facts and figures." www.esa.int. January 13, 2006. http://www.esa.int/esaCP/GGG4SXG3AEC_index_0.html.

[25] Ibid.

domestic programs, mainly France, Italy, Germany and the UK. However, the ESA is flexible enough to allow some members treat it as a substitute for domestic aerospace research, such as Ireland, Austria and several others.

The French agency CNES is particularly active domestically, engaging its own bilateral agreements with NASA and other agencies. The French have embraced a strong, independent space program all the way back to President Charles de Gaulle. The French pioneered the development of the Ariane program, albeit with substantial financial backing from the ESA. In fact, it was the strong identification of French national priorities, and the cushion their domestic capability provided, that allowed them to trigger the crisis within ESRO and ELDO and push towards a united ESA. [26]

The French fixation on grandeur and independence is not ubiquitous throughout the continent. Quite the opposite in fact as, "The notions of an external threat and the stigmatized associated with the 'partner-competitor' nature of relations with the US were viewed differently from one end of the continent to the other."[27] The Belgian attitude was one of independence from France or Germany, and preferred to rely on the US for this security, much as they relied on the United Kingdom in the nineteenth century.[28] Again, the flexibility of the institution allows each member the space to pursue independent national agendas.

The preservation of autonomy is not without its complications, successful domestic scientific programs create centrifugal force. This was the case in the 1980s, where strict

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[26] Ibid.

[27] L. Jourdain & X. Pasco. "Comparative Space Policy: The Space Policy Crisis in the American, European and French Space Programs." pg 322.

[28] Ibid., pg 323.

funding caps had slowly stifled the number of programs ESA could commission. The centrifugal force was strong enough that some speculated scientists and engineers would abandon ESA if it were not for the development of a medium-sized project every year. "ESA's projects were then no bigger and no more ambitious than some national ones. The ESA program was at risk of becoming sub-critical and of being unable to deliver what was requested from the scientific community and from industry."[29] The resolution was Horizon 2000 program, a program that refocused and re-coordinated the domestic and national programs.[30]

There are now two policies implemented to combat the centrifugal forces generated by the national-supranational structure. The first is the semi-annual meeting of important ESA and national delegates called the Capri meetings, named after the conferences' permanent location.[31] The other is the indispensable policy that directs "regular and periodic visits to all the Member States, in order to discuss directly, with the delegations and the representatives of the scientific community and of industry, their respective problems and their wishes."[32] These meetings are not emergency responses to crises, but rather a preemptive attempt to bring potential conflict to light and resolve issues before they come to fruition. This policy is essential to the success of the agency as a long-term cooperative institution, and its ability for conflict resolution, confidence building and communication surpasses the potentially icy atmosphere of Council meetings.

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[29] R. Bonnet & V. Manno. *International Cooperation in Space*. Pg 63.

[30] European Space Agency. "ESA Council Meeting at Ministerial Level Toulouse, 18-20 October 1995."October 4, 1995. August 6, 2006. http://www.esa.int/esaCP/Pr_40_1995_p_EN.html and R. Bonnet & V. Manno. pg 36-41.

[31] R. Bonnet & V. Manno. *International Cooperation in Space*. pg 69-70.

[32] Ibid., pg 70-71.

Finally, the ESA has succeeded in transferring loyalty to the supranational level. As mentioned in the literature review, the dramatic nature of space exploration has certainly expedited this process, and the ESA has been one of the most successful agencies at fostering a European spirit in cooperative ventures. Once the agency proved its credibility to member states, combined with the context of greater European integration, a gradual process of loyalty transference occurred.

Much of the agencies success can be attributed to its ability to mitigate the nationalist forces of its members. The agency itself is a product of the concerns of individual members, cognizant of their minimal individual potential in the aerospace industry. Most important to its preservation is the high degree of autonomy that still produces enough scientific return to encourage coalescence. It framers were also sensitive to the distributive concerns of its founders.

Bureaucratic Factors

The bureaucratic structure of the ESA has been one of the most important contributors to the continual success of the ESA. The framers were keen to avoid large, inefficient bureaucracies like that which had evolved at the hands of their America counterparts. An organization like ESA is capable of sustainable cooperation only through a framework of very specific rules and procedures. "Successful implementation requires a system of governance in which the roles of the players are clearly understood, the tools for careful coordination provided and process of accountability put in place."[33] The ESA convention created a system that of governance that has done just that. ESA has two main bureaucratic bodies, the Executive and the Council. The Council is the

[33] European Commission. *White Paper – Space: A New European Frontier for an Expanding Union.* pg 37.

legislative body from which political and funding approval initiates. The Executive drafts and administers the undertakings of the mandatory and optional programs.

The most important function of the ESA bureaucratic structure is to maintain the delicate balance between research of pure science and application. The convention addresses the issue in Article V by creating two different scientific programs, each operating quite differently than the other. All members participate in the Mandatory Program, responsible for pure science research.[34] It is dichotomized into two areas of study, intra and extra solar system science, referred to as astronomical fields.

The development of systems that are commercially applicable is reserved for the Optional Programs, the other programs with a much different character than its mandatory counterpart. The inclusion of optionality was one of the most important developments from the creation of the ESA. Optional programs make up 80% of the ESA budget, including an assortment of meteorological, telecommunication, navigation and Earth observation satellites. It is from the program the successful Ariane Launcher was born, one of the most noteworthy accomplishments of the agency.[35]

The Mandatory Program, the backbone of the agency, has several procurement and decision-making procedural safeguards to insulate it from both internal and external pressures. First, proposal approval requires a simple majority vote, but changes require a 2/3 vote. This means budget increases and program changes are extremely difficult to come across, bolstering the importance proposal credibility. Additionally, the decision

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[34] The members of the ESA are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

[35] R. Bonnet & V. Manno. *International Cooperation in Space*. pg 29-32.

making process is very transparent, and great precautions are taken to avoid political or industrial considerations. Unlike the optional program, there is no *juste retour* policy in the scientific program, and distributive levels are not accounted for in the decision making process. This is discussed later.[36]

The safeguards and procedures have been very effective in successfully administering research programs. The agency has never cancelled a project and projects rarely run over 25% of the initial estimate. The decision-making process places pressure on scientists and engineers to perform at risk of losing credibility. The success has important to maintaining the scientific community's enthusiasm for the Agency.[37]

The optional programs are also funded through a much different process than the Mandatory Program. Proposals are made by member states, with the tacit participation of the rest of the members. However, a member can abstain if they specifically request to do so. Contributions to the optional program are calculated according to a scale of the GNP of each member. Originally, the restriction on military technology present in the Mandatory Program was carried over to the Optional Program, but this restriction has been relaxed significantly in recent years.

Because of the inherent commercial nature of the optional program, its discussion is reserved for the next section. The emphasis for this section is mainly the decision making and authority structures, and the safeguards that protect the system. There are five important bureaucratic safeguards in place. The first is the formation of the advisory committees. The Space Science Advisory Committee (SSAC) is small, advisory body of

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[36] Ibid., pg 25-29.

[37] Ibid., pg 26.

no more than seven senior scientists that counsels the Director General. There are two sub-committees corresponding to the two major branches of activity with ESA, astronomical and solar system science. The number of scientists is limited as to insulate them from the political pressures of each other and their member states, and they are paid only minimally. This body makes apolitical, objectives decisions regarding programs removed from political and commercial pressures the DG may be subject to.

The second safeguard is the budgeting process. Budgets are established five years out and are reviewed every three years. This means projects can operate without fear of cancellation, a constant threat to their American counterparts. This five-year foresight functions as a double-edged sword to scientists inside the Agency. The long-term planning gives a great deal of stability to the project, an attribute unique among many of the space agencies of the world. At the same time, the ceiling requires unanimous consent to change, so levels can be very inflexible, stifling growth.[38] However, given the overwhelming complications that are direct results from the annual budgeting process in the US, this feature is key to the credibility and commitment of ESA to its scientists and international partners.

The third safeguard is the implementation of strict term limits for ESA officials, usually three years. These limits serve three purposes. The first is to maximize communication with the scientific community by constantly drawing on its members to the fill the agency's ranks. It also increases transparency of the organization, as well as preventing career bureaucrats from accumulating influence beyond the specific responsibility of his or her respective office.

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[38] Ibid., pg 28-29.

The fourth safeguard is more of a customary principle derived from several procedures, rather one specific policy. Transparency has been a central tenet of the ESA since the inception of ESRO, and this tradition continues today. The heavy privatization and consultative processes contribute to a "no secrets, no surprises" environment. This transparency is compounded by the above mentioned term limits, and hence, high turnover of officials.[39]

The final safeguard, like the one before it, is also a principle derived from the amalgamation of several policies. The ESA places great importance on the credibility of projects in all stages, from conception through operation. The market based approach gives incentive to contractors to keep costs as competitive as possible. However, the funding procedures already addressed, in conjunction with the expertise of the scientific advisory boards, pressures contractors to be as credible as possible with estimates. In an industry heavily reliant upon public investment, a strong relationship with ESA is extremely important. Paradoxically, the bidding process has served to increase and strengthen cooperation, not incite nationalist protectionism as one might predict.[40]

There is one more bureaucratic program in place worth note, necessary to accommodate the variety of members that compose the ESA. As previously mentioned, many of the ESA members maintain significant national programs, and have the necessary administrative considerations for ESA membership. Other members, however, are either not capable of or choose not to operate national programs. For these members,

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[39] Ibid., pg 41-45.

[40] Ibid., pg 53-57.

the ESA functions as their both their national and supranational agency, and their domestic interests should not suffer because of this.

The solution to this problem is a program abbreviated as Prodex, short for *Programme de Développement d'Expériences*. It is an optional program available to the group of states without domestic space programs necessary to accommodate projects that have been selected by the SPC, but require domestic funding under the mandatory program guidelines.

> For example, there exists cases where the total financial contribution of a Member State to space activities, both European and national, is included in the ESA contribution, and where mechanisms do not exist to redistribute money inside the country to pay for the development of experiments or payloads. The Prodex program allows for this possibility.

Ireland, Switzerland, Belgium and Finland recently participated in the program with the development of the James Webb Space Telescope, a multilateral project involving ESA, several member states, Canada and the US.[41] This important program ensures equal opportunity for participation and development even at the smallest levels of national participation.

The above mentioned bureaucratic designs and safeguards have been effective in the facilitation of continued multilateral space activity. The emphasis on privatization, transparency and above all science before industry has produced one of the most efficient and effect supranational institutions of mankind. The unique decision making process, the explicit dichotomization of scientific and commercial programs, as well as numerous

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[41] European Space Agency. "European agreement on James Webb Space Telescope's Mid-Infrared Instrument (MIRI) signed 10 June, 2004." www.esa.int. May 2, 2006. http://www.esa.int/esaCP/SEMYWW2VQUD_Expanding_0.html.

safeguards have been very successful, and serve as a model for agreements entering the institutional setting.[42]

Economic Factors

The pooled resources approach of the institutional setting offers a unique case for this study. There is a far greater amount of resources spread amongst a greater number of members than any other space agreement. Additionally, ESA's market-based approach further complicates the process. The agency has, however, found the right formula to fairly distribute the investment, one worth a closer look.

The decision to pursue a market-based space industry required certain, special accommodations in the framework of ESRO and later ESA. One the initial driving forces was, after all, the desire to rebuild European infrastructure, and the market-based approach was agreed upon as the best means to build this capacity. It was also understood that the proper measures must be to balance the competitive market forces with geographic distribution. *Juste retour* is not specific to the ESA though: "All R&D organizations in Europe and indeed throughout the world, whether they be international or national, have established explicit or implicit equitable geographical-return arrangements."[43]

Bonnet and Manno offer a compelling abridged version of the policy as it appears in the convention:

> In the execution of the Agency's programs, maximum use should be made of industry, as opposed to building up an ESA in-house capacity; utilization of

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[42] European Commission. *Green Paper – European Space Policy.* pg 28.

[43] B. Battrick (ed.). *Agenda 2007 – A Document by the ESA Director.* pg 20-21.

> industry should be based on free competitive bidding developments and procurements should in principle make use of Member States' industries; an adequate geographical distribution of contracts to Member States' industries should be ensured; a balanced development of a competent European space industry should be aimed at through the use, structuring and rationalizing of existing industrial capabilities; measures should be taken to improve the worldwide competitive of the European space industry. [44]

The impressive buildup of the space industry in Europe can largely be attributed to the industrial policy of the ESA. While the full extent of the policy is quite complicated, including the specifics regarding multinational companies with overseas holdings, the central premise is known as *juste retour*, or just return. The system operates on the principle that a Member State should receive roughly the same percentage of return investment as it contributes to the ESA annually. This rate of return is measured through an industrial return coefficient calculated as the ratio between "the portion of all contracts placed by the Agency in the industry of a given Member State to the average percentage of contributions of that Member State to the budget that the Agency spends in industry."[45]

Some investments, however, require greater infrastructural and technological build up, an element accounted for in calculating *juste retour*. The coefficient is weighted according to the nature of the activity in the Member State, with the weighting factor between zero and one. The higher the technological sophistication of a contract, the higher the factor is for the state. Thus, the *juste retour* coefficient is not simply a financial measure, but rather an industrial one.

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[44] R. Bonnet, R. & V. Manno. *International Cooperation in Space*. Pg 48.

[45] Ibid., pg 49-50.

The implementation of the policy has not always been easy. Critics charge the practice has "stalled decisions, cost hikes and . . . [is] an obstacle to competitiveness and creativity, in conflict with the European Union Treaty."[46] The disregard of competitive bidding, while necessary, at times has been a very unpopular practice. The implementation has not always been accurate, either. When contracts fall behind or encounter unforeseen difficulties the forecast return may become an inaccurate representation of the new return.[47] Over time these deficits can add up. While great efforts are made to ensure the system is very thorough in its planning and implementation, experience shows the trend is these deficits are not recovered, and can amount to significant imbalances over time against smaller nations.[48]

Juste Retour has, at times, been fraught with substantial complexity nor has it been without its critics. It has been, however, absolutely instrumental to the development of ESA, especially in the initial stages when loyalties had not been formed and the sector was still in its infancy. Although there were initial growing pains, the industry is now robust, employing 30,000 people across 2000 different companies.[49] Bonnet and Manno state that the policy "has had a clearly positive effect on the determination of the various Member States to support an international European space program and participate fully in the Agency's activities."[50]

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[46] B. Battrick (ed). *Agenda 2007 – A Document by the ESA Director General.* pg 20-21.

[47] R. Bonnet & V. Manno. *International Cooperation in Space*. pg 53.

[48] B. Battrick (ed). *Agenda 2007 – A Document by the ESA Director.* pg 20-21.

[49] European Commission. *Green Paper – European Space Policy.* pg 12.

[50] R. Bonnet & V. Manno. *International Cooperation in Space*. pg 53.

Within the context of the ESA today, there is a large, open dialogue as to the necessity, the expense, and the usefulness of *juste retour* as the agency enters the new millennium. The cost effectiveness of the institutionalized inefficiency, sometimes requiring the coordination of as many as 40 firms in 13 countries, is a very difficult calculation.[51] Recently the Director General posited "geographical-return will remain an efficient and attractive tool provided: 1) it may be adapted to each type of programme; 2) measures may be taken to avoid cumulative discrepancies per programme and their adverse consequences."[52] Irrespective of its critics and its role in the new era of the ESA, it would be safe to say the Agency would not be as successful as it is today, if it was able to survive at all, without *juste retour* and its principles.

Conclusion

The cooperation that initiated and resulted from the ESA is truly the result extraordinary circumstances. As former ESA DG Reimar Luest posited, "when resources abound and opportunities plentiful, cooperative attitude abounds. When resources shrink, altruism takes a back seat."[53] As long as there exists a healthy amount of scientific and political interest in the space industry, there will be enough resources for a continued, multilateral space agency effort. However, history seems to indicate that, even in the acknowledged environment of the benefits of cooperation, nationalist forces can be a very powerful within the framework of the institution.

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[51] Ibid., pg 56.

[52] B. Battrick (ed). *Agenda 2007 – A Document by the ESA Director*. pg 20-21.

[53] Reimar Luest. "The Cooperation of Europe and the United States in Space." pg. 5.

The ESA has developed an institutional model, however, to permanently cope with these forces, along with solutions *a posteriori*. It is flexible in its participation, and the bureaucratic channels governing decision making and authority are clearly defined and fair to all involved. Additionally, the organization has a high degree of transparency that again is fair to all involved. The same is true of the just return: while it has been extremely successful, it has not been without growing pains. Although all of the factors could have produced irreconcilable obstacles to integration, the highly institutionalized solutions have mitigated their presence in the cooperative process.

With this said, the fallibility of a system devoid of long-term, strategic foresight has since become apparent.[54] Today's subfield of military space application features five communication programs and three observation programs, and coordination among these programs is likely a very difficult practice.[55] Additionally, critics charge that short-term market pressures provide disincentives to pursue long-term strategic developments. Institutions cannot simply ignore the important issues indefinitely; in every case the cooperative arrangement eventually is confronted with the problems previously ignored. No on will argue, however, as to the program's utility initially; it was indispensable in the formation and loyalty transference to the agency and its endeavors

Additionally, the transferability of the European model is generally very limited. The integrative trend that spurred the ravaged post-WWII continent back to its economic feet is by all means a remarkable story and analysis removed from the social, economic, and political context of the period would fail to adequately tell the European story. The

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[54] B. Battrick (ed). *Agenda 2007 – A Document by the ESA Director*. pg 5-6.

[55] European Commission. *Green Paper – European Space Policy.* pg 8.

normative question of whether institutional cooperation of the public and private aerospace sectors was indeed the epiphenomenal outcome of integrative forces elsewhere is an important question regarding the future of cooperative ventures, yet outside the scope of this study. Still, the ESA offers the best example of how a cooperative framework can successfully confront and accommodate all of the identified factors of this study.

Regardless of systemic changes exogenous to the agency, internally, the ESA will continue to serve its members in the same role as was intended at its inception. The agency's symbolic and functional outcomes serve as a stark example of not only the tremendous changes that have occurred on the European continent, but of which projects are attainable in the unique, piecemeal fashion Europe approaches exploration and development.

CHATPER 5
INTERAGENCY CONSULTATIVE GROUP (IACG)

Since its discovery in 1758 by the famous English astronomer Edmund Halley, the comet bearing his name has fascinated scientists and story-tellers alike. The comet's history is a remarkable one, first appearing in recorded history as early as 240 BC, although unconfirmed reports date its first recorded spotting to 2467 BC.[1] By the time the comet made its last approach closest to Earth in 1986, astronomers the world over were ready for its arrival.

Aside from the symbolic victory of the successful coordination and study of such an iconic figure, IACG offers much more to this study. The comet's timing coincided with the changing of one of Johnson-Freese's epochs of cooperative exploration. Several actors had ascended to the forefront of the space scene and had acquired legitimacy. She follows says of the period "in the past cooperation basically involved either the United States launching something for another country" or cooperating only as far as developmental phase. "Cooperation now has evolved to include longer and more open ended projects"[2] The development of these longer, open-ended programs put significant strain on the bargaining phases of cooperative programs. NASA Director Kenneth Pederson described the conflict as the "balancing [of] national or regional pride with the

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[1] "Comet Halley." www.wikipedia.org. August 1, 2006. http://en.wikipedia.org/wiki/Comet_Halley

[2] J. Johnson-Freese. *Changing Patterns of International Cooperation in Space*. pg 53.

fiscal and technical imperatives pushing towards broader-based multinational cooperation."[3]

IACG was developed as a compromise in this new environment. It was created as an attempt "to acknowledge the need for cooperative efforts and to find a solution to the dilemma…of balancing national and international interests."[4] Once the comet disappeared for another 75.3 years, policy makers hoped to export the same model to other science-specific projects. Although there was significant optimism initially, time has shown these hopes to be misplaced, and instead, IACG has revealed a paradoxical relationship between institutionalization, success and autonomy.

Historical Context

Astronomers and policymakers were both keenly aware of the attention that would be directed towards the international efforts to study Halley's Comets. There were in all five probes sent to study the comet, two Soviet (VEGA 1 and 2), two Japanese (Sakigake and Suisei), and one European, (Giotto).[5] Policymakers recognized quickly that, in the absence of any new project development, and given the potential benefits of cooperation, some cooperative agreement should be sought.

Originally it was suggested the cooperation occur through a third-party, and the Committee on Space Research was suggested. After initial debate, this idea was rejected, and it was decided the best avenue for success would involve the direct communication

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[3] K. Pedersen. "The Global Context: Changes and Challenges." *Economics and Technology in U.S. Space Policy*. ed. Molly Macauley. Washington D.C.: Resources for the Future, 1986. pg 187.

[4] J. Johnson-Freese. *Changing Patterns of International Cooperation in Space*. pg 101.

[5] R. Bonnet & V. Manno. *International Cooperation in Space*. pg 90.

of space agencies and officials. The decision on this arrangement, five years before the comet's visit in 1981, marks the creation of IACG.[6]

The first meeting of officials from the four agencies, NASA, ESA, the Japanese Institute of Space and Astronautical Science (ISAS) and the Soviet Space Science Academy (IKI), in addition to a group approximately one thousand amateur astronomers functioning as interest group under the name International Halley Watch (IHW). The last entity, IHW, was organized by NASA and ESA officials to coordinate ground observation of the comet.[7] NASA's inclusion in the group is a token to its primacy in the international system. There was an amount of criticism questioning the role of NASA in the group when they were not sending a probe directly to the comet. However, it was "unthinkable to do a space science venture of this magnitude without the experience and involvement of NASA personnel."[8] The project would in fact be a much different role for the agency that was notorious for throwing its weight around in cooperative agreements.

The main mission for the IACG encounter with Halley's Comet was known as Pathfinder. Differences in the timing of the approaches of the five previously mentioned probes made it possible for scientists to get much closer to the nucleus of the comet than would possible otherwise if they could coordinate their efforts. This was a highly technical and ambitious endeavor; however, if it worked, its success would be heralded not only as a great scientific achievement, but as a political one as well. The IKI probes

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[6] J. Johnson-Freese. *Changing Patterns of International Cooperation in Space*. pg 102.

[7] Ibid., pg 102.

[8] Ibid., pg 103.

Vega 1 and 2 would approach the comet first, and measure the location of the nucleus, and NASA was responsible for locating the Vega crafts with its Deep Space Network. The information would then be forwarded to the ESA mission control, where their probe, Giotto, could be navigated closer to the nucleus.[9] The project was a success, as Giotto flew within 56 km of its intended trajectory, a significant improvement from the 400 km that scientists estimate would have happened had it not been for the Pathfinder mission.[10]

After such a resounding success, those responsible for IACG felt that extending Pathfinder's success to other projects was a logical next step. An extension, though, would require the drafting of at least some type of managing protocol. This process would certainly considerable complications and conflict between the USSR and the US, two entities very concerned about cooperating with each other. One NASA official captured these feelings in this way:

> The thing that makes us uncomfortable is that the IACG lumps together our friends and our allies with the Soviets. We know how to conduct relations with our allies; we know how to conduct relations with the Soviet Union. But we do it differently. The problem with IACG is that it lumps everything together.[11]

Despite its initial promise, the group was not able to replicate the success enjoyed in the Halley project. It quickly fell apart when it transferred to Phase II operations, a program to organize solar exploration. The failure to institutionalize IACG for long-term cooperation should not necessarily overshadow its short-term achievements. The Pathfinder mission was a significant success both politically and scientifically, and marks one of the best models of epistemic cooperation. The project also seems to offer a

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[9] R. Bonnet & V. Manno. *International Cooperation in Space*. pg 90.

[10] J. Johnson-Freese. *Changing Patterns of International Cooperation in Space*. pg 105.

[11] Interview with Michael Michaud, Washington, D.C. 4 May 1998 from Johnson-Freese, J., *Changing Patterns of International Cooperation in Space*. pg 107.

curious tandem of both successful and ineffective policies as well, the subject of discussion below.

Nationalist Forces

Any multilateral effort that succeeded in getting both the USSR and the US to agree to some cooperative venture must be heralded as a resounding triumph over security concerns. At the time of the Halley project, there were no official lines of communication or even statutes to sanction technological exchange between Soviet and US space agencies. All information exchanges between the Soviet and US agencies had to be relayed first through the European Space Operations Center (ESOC). After the fact, officials agreed that although the preparations for the cooperation were difficult, the results, both symbolic and functional, merited the effort.

To achieve this there were several precautions that administrators were keen to avoid potential security concerns and interference from the State or Defense Departments. First, policymakers were very insistent on limiting the scope of the project specifically to the study of Comet Halley. The preservation of the organization as purely scientific allowed the scientists to leapfrog security concerns in its implementation.

Additionally, "national autonomy was safeguarded by the fact that the Pathfinder was desirable for project enhancement, but not essential to the carrying out of individual projects."[12] All of the probes were designed and approved on the national level, without any supranational pressure. IACG reinforced this guideline in the Terms of Reference, stating that no formal planning was take place through ICAG. The explicit desire to keep

[12] J.P. Lester, E. Sadeh & W.Z. Sadeh. "Modeling International Cooperation for Space Exploration." pg 215.

projects as separate and autonomous as possible also helped mitigate the concerns of remaining, skeptical officials.

There were, after all, many officials who believed the cooperation was too great a challenge given the political conditions. "There was considerable doubt that the organization could withstand the rigors of its mission, primarily from a political perspective."[13] The organizational pressures from coordinating five entities are enormous; notwithstanding the fact two entities were superpowers with icy relations.

Projects as difficult as Halley require an extra catalyst to realize its full potential, and IACG got theirs in the form of a handful of charismatic, visionary leaders. Just as the success of ESA cannot be removed from the context of the ambient attitudes towards greater European integration, the success of ICAG is largely accountable to the representatives of each of the member states' space agencies. All of the directors of the national agencies were experienced internationalist, and each helped with domestic concerns of sovereignty and security.[14] Several times when the political challenges appeared insurmountable, the entrepreneurial ability of these key policymakers rescued the process from deadlock. While difficult to quantify, their contribution is unmistakable and irreplaceable.

The majority of the nationalist problems that appear in other more institutionalized studies such as the ESA and ISS are notably absent however. The policymakers were aware what policies might cause conflicts of interests, what that would do to the process, and explicitly avoided them. With these precautions, the epistemic community still faced

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[13] J. Johnson-Freese. *Changing Patterns of International Cooperation in Space*. pg 104.

[14] Ibid., pg 103.

significant problems in this sphere, no doubt a testimony to the tension of the Cold War space arena.

Bureaucratic factors

The IACG's greatest contribution to this study is to the understanding of the role of the bureaucratic factors in both of its endeavors. As mentioned earlier, the IACG case offers the unique situation of superb achievement followed by marked failure. It serves as a stark example to the proponents of informality: it works, but only for a little while. Soon, non-institutionalized cooperative arrangements find themselves in precarious situations, balancing utility and capability. Successes like the Halley Project encourage national policymakers to increase the scope of the projects, without the willingness to cede either the necessary authoritative or budgetary procedures. If cooperative ventures go without major achievements, however, their existence is questioned. Epistemic Communities are left in the middle of these processes.

Much of the success of the Halley project can be attributed to the insistence of policymakers to keep it as informal as possible. Drawing on lessons agencies had learned from previous cooperative agreements, the provisions were drafted in the spirit of making the group as sustainable as possible. The guidelines to the Halley project were explicit in their control of only scientific data and the data gathering processes. The Terms of Reference tried to preserve the structure and culture of informality as was possible. They barred IACG in the formal drafting and development stages of a project, maintained for the necessity of space science, and provided that IACG should not assume the role of any other existing bilateral or multilateral agreements. The informality of the agreement works in select cases, and this one-time, non-security oriented epistemic community based venture is definitely one example of success.

When the Pathfinder mission proved overwhelmingly successful, all involved sought to continue the Group. There was, unfortunately, the question of how to arrange a permanent agreement to accommodate all those involved. The solution was to keep the organization as informal as possible, and Terms of Reference were adopted ensure this quality. These rules reflect the three most important operating principles: (1) no or minimal technology transfer (2) no transfer of funds (3) the group was to be an advisory body to its member states. The statement of purpose was,

> The objectives of the [IACG] are to maximize opportunities for multilateral scientific coordination among approved space science missions in areas of mutual interest. The IACG is a multi-agency international forum in which space science activities are discussed on an informal basis among representative of member agencies.[15]

After Pathfinder the group changed its name to the Interagency Consultative Group for Space Science, and explicitly dedicated themselves to this purpose only. Within the Terms of Reference were several pragmatic policy guidelines. They are:

- Only to serve coordination effort for approved space science programs
- The group is to take no formal planning role in any mission or missions
- The group is at no point to replace bilateral agreements or other existing multilateral frameworks
- Leadership roles of IACG must be filled by senior officials within members states
- IACG can work with epistemic communities or other sub-state actors to supplement discovery if required by a program
- Senior members will periodically review the groups necessity and effectiveness[16]

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[15] United States. "Inter-Agency Consultative Group for Space Science, Terms of Reference." Washington D.C.: Government Printing Office, 1981. pg 1.

[16] J. Johnson-Freese. *Changing Patterns of International Cooperation in Space*. pg 106-107.

Interestingly, the framework was amorphous in outlining its objectives, yet very clear in how to facilitate them. It would prove to be enough to conciliate all administrators involved, including the apprehensive Americans.

Unfortunately it would not prove to be the magic bullet of multilateral cooperation all involved were after. The post-Halley operations were known as Phase II, and were focused to study solar terrestrial science. The project would quickly assume the responsibility of coordinating thirty satellites and the four national agencies involved in the study. The expansion led to the inevitable necessity, and hence formation, of certain bureaucratic procedures and structures. Without appropriate mechanisms governing decision making and other complications, the organization was ineffectual at conquering such a large undertaking. When policymakers tried to export the Halley model to other projects, namely the Solar Terrestrial Science Project, the model fell apart. Sadeh offers, "The IACG is deficient in the requisite organizational mechanisms like a formalized organizational charter specifying decision-making procedures and distributions of financial resources. This has resulted in a level of commitment that is not commensurate with the task at hand for ISTP."[17] Thus, IACG failed to engineer appropriate bureaucratic channels under the banner of informality and at the insistence of the epistemic community. This directly led to its demise, and offers an excellent example of the organizational balancing act detailed in the introduction.

Before moving on to the next section, a hypothetical seems appropriate: The necessity of the informality was born out of the unique situation of bringing the two hostile states, the US and USSR, together under one cooperative agreement. One must

[17] E. Sadeh. "International Space Cooperation." pg 304.

question what form the Group might have taken without one of the two. This might have relaxed the necessity for the informality and led the creation of a more sustainable, permanent advisory group. Some even speculated the development of an International Space Science Agency (ISSA) as the evolutionary product of the IACG. "Logic suggests that a new international institution such as an ISSA would have to be the culmination of a series of incremental steps."[18]

Economic Factors

There are virtually no economic complications in this case study. Nevertheless, this does not mean that the IACG case does not apply to this factor. Although the Group may have had much greater potential with the provisions to help in the formalization of national procurements, officials chose to keep the Group from heading down this path. The absence of economic factors is as much a testament to the difficulty of coordinating national industry, as well as the bureaucratic arrangements necessary to facilitate appropriate programs.

Within the context of the initial Halley program, the IACG does not offer insight into the way economic factors can inhibit cooperation. The group was responsible for coordinating projects that had been procured at the national level long before the Group came to fruition. The subsequent transition into the second phase reflects a great concern of the issue, in fact. Policy makers explicitly stated that the Group was to have no role in the formalization of any national programs, and was to serve instead only a forum for discussion.

[18] K. Pedersen. "The Global Context: Changes and Challenges." pg 187.

Conclusion

Why did IACG succeed at its initial mission? Bonnet and Manno answer the question by offering, "the IACG succeed fully because the goal was very precisely determined, because there was a maximum of informality and a minimum of bureaucracy, and because there was no exchange of hardware, all interfaces between the various participants [were] clearly established."[19] Again, this model is only effective for short-term agreements. The informality approach is simply not a sustainable form of cooperative agreement, regardless of the role epistemic communities and other concerns, such as national interest. The agreements of this nature will either have to adopt a more institutional format, or will inevitably dissolve back to individual autonomous states. Still, IACG gives a glimpse at the possibilities for epistemic community coordination.

[19] R. Bonnet & V. Manno. *International Cooperation in Space*. pg 92.

CHAPTER 6
INTERNATIONAL SPACE STATION

The ISS is the most complex engineering feat ever undertaken in the history of man. When completed, the station will be 450 tones of the best mankind can engineer soaring at five miles a second 240 miles above the surface of the Earth with a price tag in the range of $100 billion.[1] Getting this behemoth into Low-Earth Orbit (LEO) is no small feat, and certainly beyond the capability of any single country. Quite the opposite is true, as the station is the progeny of three decades of the cooperative efforts of the 16 states. The ISS has been labeled as the litmus test for current and future space cooperation agreements. Although the project has not been without its setbacks, the ISS has been a great success in cooperation.

The literature points to three distinct eras of cooperation in the ISS framework. The first is the coordination phase, lasting from 1982 until 1984, and features most prevalently the dominance of the US in the program. In fact the space station program was created unilaterally in 1982 by NASA without any formal support from the legislative or executive branches or any foreign entity. Following this coordination phase is the augmentation phase, the period from 1984 to 1989. It was in this period Ronald Reagan gave his 1988 State of the Union address, during which he invited friends and allies to participate in the development and use of the space station."[2]

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1 P. Bond. *The Continuing Story of the International Space Station*. Chichester, UK: Praxis Publishing, 2002. pg 2.

[2] J. Johnson-Freese. *Changing Patterns of International Cooperation in Space*. pg 83.

The third phase, the interdependence phase, began approximately in 1993 and continues to present. It is in the phase that US administrators have ceded responsibility of units critical to the station to foreign entities. As usual, this important step forward in cooperation was not born out altruism. Rather, it was the NASA solution to the precarious budgeting quandary it encountered on Capital Hill. From 1991 to 1997 congressional support for ISS dwindled significantly, and there were 19 attempts to cancel the program in the face of significant protest of both domestic and foreign dignitaries.[3] Further integrating foreign partners into the ISS program would serve bolster the program to two ends. First, it was believed that deepening the channels of cooperation would make cancellation so catastrophic to the reputation of the US, both as a technical partner but also as an ally, as to remove the option from the table completely. Secondly, reducing the commitments\ of the US to the project would reduce costs.

Additionally, it was during this phase the USSR dissolved, ending the Cold War. President William Clinton was keen on linking US foreign policy to its space policy. Adding Russia as a partner would help stabilize its fragile democratic system and transitional economy. Officials were also concerned about idle Russian scientists. By adding them to the project, it gave "economic incentives for the Russian scientific elite to stay at home through participation in ISS hardware development." Moreover, participation would offer an incentive for the government to adhere to the Missile Technology and Control Regime.[4]

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[3] E. Sadeh. "Technical, Organizational and Political Dynamics of the International Space Station Program." *Space Policy* 20.3 (2004). pg 176.

[4] J.P. Lester, E. Sadeh & W.Z. Sadeh. "Modeling International Cooperation for Space Exploration." pg 220.

This case study focuses on the late augmentation and interdependence phases of the project. This era reflects the current status of the project most accurately and thus provides the best ground from which to draw conclusions.

Nationalist Forces

NASA's no exchange of technology policy is one of its most time-honored and respected policies. So institutionalized is this policy that the Departments of Defense, Commerce and State have regulatory committees that oversee international agreements to protect its mandates. "One of the most important responsibilities that you will have related to the international aspects of the program is to protect against the adverse technology transfer. NASA must support U.S commercial and national security interests-as we have always done."[5] Some technology transfer, however, would certainly have to occur in order to meaningfully build the station in the desired cooperative fashion.

To reconcile this, policy-makers set out to make a framework to control wanted and unwanted transfer. Transfer that occurred when two systems interacted was considered an acceptable loss. Scientists and engineers were to strive for the cleanest possible hardware interfaces when units of two different nationalities were together. Additionally, there were to be no foreign contributions to the development of the individual modules, called R&D teaming.[6] The concession, while minor, was important step in the direction of cooperation. Additionally, this policy was effective as long the US remained functionally independent in the construction of the station.

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[5] J.M. Beggs. Letter to Gerald D. Griffen.

[6] E. Sadeh. "Technical, Organizational and Political Dynamics of the International Space Station Program." pg 173.

When the program transitioned into the interdependence stage the project needed commensurate procedural adjustments to accommodate the new conditions. The rules had changed for two reasons. First, Russia joined the project in 1993, significantly complicating the project. The Russians were brought onto the project primarily because of their operational experience with their own space station Mir. Arranging the proper terms for the agreement would not be easy given the US government had numerous initiatives in place to prevent any technology transfer to the Kremlin. Secondly, ISS was transferring from functional independence to interdependence, an arrangement requiring many more hardware interfaces and thus potential unwanted transfer.

To address both issues NASA drafted the Technology Transfer Initiatives (1993). The initiatives "safeguard against the unauthorized transfer of sensitive technology and make sure that appropriate regulatory export control approvals for transfer of technological items necessary to integrate, test and operate ISS as a complete system are in place."[7] NASA also commissioned a Space Station Export Control Steering Group to address "its needs for appropriate regulatory approvals for the duration of the program."[8] When the next round of renegotiations was finalized in 1998 a technology transfer regime had been established, and in fact the agreement included some degree of flexibility on the issue. It still identified which areas were on and off limits, but the formality of the exchange was reduced considerably.

The transfer of technology that has occurred in the ISS program is a significant departure from conventional non-transfer cooperation. In a very pragmatic spirit,

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[7] Ibid., pg 180.

[8] Ibid., pg 180.

officials identified where technology transfer had to occur to make the project work. They then pursued the appropriate means to facilitate the transfer while keeping unwanted transfer from occurring and without compromising security of any involved. Policy-makers left nothing ambiguous: everything was institutionalized and formalized. It is an excellent testament to the effectiveness of identified and institutionalized cooperation.

Bureaucratic Factors

Just as the evolved into an interdependent project, so too has the decision-making process evolved in a similar process. The decision-making process of the program has been a general reflection of overall power dynamic of not only the space community, but also of global politics. The interdependent arrangement that emerged from the 1998 agreement offers a fascinating, complex agreement of both multilateral and bilateral arrangements.

The initial years of ISS were dominated by the US, and the decision-making and management processes reflected this. Throughout the late 1980's and early 1990's NASA instituted a *quid pro quo* policy for management to encourage participation among the members. Managerial participation was roughly commensurate to the amount of commitment a partner made to the program. To facilitate this relationship NASA insisted on multiple bilateral agreements rather than one multilateral agreement. The international partners did not believe this to be in the spirit of true cooperation.

As long as NASA retained functional independence of the station they could unilaterally determine the managerial structure. As the budget squeeze on Capital Hill forced some critical components the station overseas, so too did it send the means to maintain this arrangement. The 1989 agreement that characterizes the augmentation

phase was in fact a compromise of the two. In similar fashion to the later 1998 agreement, the 1989 cooperative arrangement featured a series of both bilateral and multilateral agreements. NASA retained its authority over the technical and programmatic aspects of the ISS through the bilateral agreements, while at the same time a multilateral agreement among the four members, Canada, ESA, US and Japan, established the policies and legal principles governing cooperation.[9]

When Russia joined as a partner in 1993 it complicated the process considerably. Russia was admitted with the same status as NASA in terms of authority, management and decision-making, the management structure at the time did not reflect this notion. As an example, part of the 1989 agreement stipulated that NASA could play a directive role in the engineering of Russian contributions. Additionally NASA had the right to make unilateral decisions in the event that a multilateral compromise cannot be reached. In short, the decision-making authority of NASA was not commensurate with their newly reduced functional role.

Several important compromises reflected the new power arrangements in the 1998 agreement. Like its predecessor, it too was a collage of bilateral and multilateral agreements. First, the 1998 agreement explicitly establishes management as a multilateral endeavor.[10] This includes "overall Space Station technical reviews, including integrated design, critical design, design certification, safety and mission assurance, operations readiness and flight readiness reviews."[11] Within this framework, the

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[9] Ibid., pg 181.

[10] Ibid., pg 180-182.

[11] United States. National Aeronautics and Space Administration. Article 6, "Memorandum of Understanding between the United States National Aeronautics and Space Administration and the Russian Space Agency." January 29. Washington D.C.: Government Printing Office, 1998.

agreement also specifically names the US to play a lead role in management. This is role, however, is different from its previous position in that the agreement stipulates for the leadership in coordination of partners, not the direction of partners.[12] Third, the agreement drafted a number of multilateral management forums to foster closer collaboration in the development and assembly phases. The hope was to establish common and standard interfaces to ease the interoperability of the interdependent station. Several important provisions were also excluded in the agreement. Until the new agreement, the US had the power to veto any activity affecting the critical components of the station deemed unfavorable. The authority framework of the new agreement required a multilateral consensus to make decisions of this nature.[13]

Given the historical record of NASA and the international system, one would expect that it would be reluctant to relinquish its authority over the project. On one hand, the transition to the multilateral decision making process was in part the inevitable product of the inclusion of Russia, itself a politically motivated endeavor. The majority of the shift is due to NASA's new, reduced position in the global space industry. Although it is still the largest player by far, administrators will likely have to pursue cooperation in the future in disconnected fashion from its past policies. The restructuring of the functional arrangements of the program in 1998 was considerably easier because of the momentum of the project; it has yet to be seen how NASA will negotiate agreements from scratch.

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[12] E. Sadeh. "Technical, Organizational and Political Dynamics of the International Space Station Program." pg 181-182.

[13] Ibid., pg 182.

One last thought on the section is necessary before moving on. The connection between space and foreign policy has never been questioned and indeed the 1990s served to bolster this claim. However, the 90s were also subject to unique international political conditions following the end of the Cold War and the hegemony of the US. Different political systems may have spawned ISS agreements departing from the agreement enjoyed today. Certainly contemporary political attitudes would affect the negotiations if the 1998 agreements were being drafted now. The unique political conditions must be kept into consideration when drawing conclusions from its lessons.

Economic Factors

The commercial promise of the ISS was one of the biggest factors in the initial development of the station. It seems though that these plans have failed to consolidate as the station now remains exclusively a research outpost. The ISS is to a degree a compromise of the economics conditions of the first two studies. The ISS agreement is not exclusively involved in the joint procurement of hardware, nor does it explicitly exclude this practice. It does instead meet in the middle, embodying certain aspects of both. The majority of the hardware of the station is developed and assembled endogenous to each partner. Nevertheless, there are some hardware components that have been developed jointly, and more importantly, the inclusion of Russia saw a breach in the NASA policy of no transfer of funds. Most importantly, there was the incredibly complex problem of proprietorship and intellectual property rights. So insistent was US government to resolve the legal issues that one ESA official remarked that his agency's most important contribution could be a component designed not for scientific

experiments, but to deal with legal problems.[14] Finally, there is the issue paying for the operations cost of the station. They are all issues pertaining to the generation and the expenditure of funds, and all were dealt with in a cooperative, multilateral fashion.

To accommodate all of the partners on the issue of proprietorship, Russia proposed a "you keep what you bring" policy.[15] Russia was responsible for its elements of the station, the other partners responsible for theirs. It was a simple plan and avoided a complicated addition to the system already in place. The previous partners of the ISS, that is Japan, ESA, Canada and the US, had a system in place to organize and distribute operational costs, generally commensurate with the functional pressurized volume on the station.

The entire ISS design includes over 40 launches to construct the station and many more to service it. The distribution of these launches has at times been a contentious issue as well. The ESA has negotiated fervently to secure as great of a percentage as possible of the launches for its less established rocket program Ariane. Because of the finite and closely regulated nature of the number and timing of the launches, they were able to negotiate a portion of the launches.[16]

One of the most publicly visible aspects of the inclusion of Russia into ISS came in 1994. In this year NASA broke with its strict policy and instituted $800 million in payment to the beleaguered Russian Space Agency. The money was to serve two

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[14] J. Johnson-Freese. *Changing Patterns of International Cooperation in Space*. pg 89.

[15] United States. National Aeronautics and Space Administration. "NASA–RSA Space Station Memorandum of Understanding Negotiations." Memorandum to Distribution. Washington D.C.: Government Printing Office, 1995.

[16] E. Sadeh. "Technical, Organizational and Political Dynamics of the International Space Station Program." pg 179.

purposes for its recipient. First, it was a much needed boost in funding to the organization. The agency had received less than half of its budget allocation of $81 million.[17] The money would guarantee that the agency would be able to fulfill its obligation to the critical portions of the station. The money also guaranteed Russian participation in the Missile Technology Control Regime, preventing the imminent sale of a liquid fueled rocket technology to India. Russia would subsequently be required to "consult with the US before exporting missile technology."[18] The space policy link to international politics in this case has very important ramifications on the station and the commitments of its members. Without this money Russia would not have been able to fulfill its commitment to the agreements.

The majority of the potential complications stemming from the joint construction and use of ISS were mitigated using two principles. The first, the keep what you bring policy, was important in simplifying the interface between the Russian and International units. The second, one of access-equal-to-contribution, simplifies the issue station allocation and operational costs.

Conclusion

When completed, the ISS will represent a remarkable success for mankind. Its existence is not only impressive in the physical, tangible sense, but also intangible. It is the fruition of cooperation, at times more than others, across three decades. Partners have bargained, forfeited and fought but never relinquished the cooperative effort, despite the best efforts of the US congress.

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[17] "Space Industry to get up to $800 Million from U.S." Interpress Service- Moscow. September 16, 1993.

[18] Ibid.

The success is in large part due to the highly institutionalized format that cooperation has taken. All of the factors are present; however, the framework is largely treaty based and unambiguous. This helps avoid the problems described in the introduction behind the exclusive use of MOU. Additionally, partners have been flexible to the evolutionary nature of the project. When the US was forced to reduce its roll in the project, other partners were more than willing to increase their commitment to the project. In response to this, the US was willing to compromise a few its most respected traditions.

It is also important to note the role of momentum in long-term projects like ISS. Once the initial few billions dollars were spent on the project, partners have a powerful incentive to facilitate that most effective cooperative arrangements. More specifically, the US was willing to breach the previously mentioned traditions and continue participation, despite the sizable presence of opposition domestically. Just like the importance of greater European integration in the context of the ESA, this momentum is difficult to quantify, yet undeniable in presence.

CHATPER 7
CONCLUSION

Space has always been an object of fascination publicly, academically and politically. As humankind sails into the 21st century, there is no reason to believe that this phenomenon will change. Quite the opposite is true, as potential propulsion and construction technologies seem offer more promise in the industry than ever before. To utilize these potentials breakthrough to the fullest, policy makers must fully realize the lessons of the past.

It is for this reason that scholars must study the developments of the past two decades for what lessons history can teach. The price tags of space exploration are simply too large to tolerate dereliction. For whatever reason, be it pragmatic or altruistic, the drive to cooperate and to coordinate the efforts of the dozen or so actors will be there. The means to facilitate the cooperation may or may not be there with it.

This study has demonstrated the different ways policy-makers have addressed the three major factors across different organizational arrangements. The nature of each cooperative effort in large part determines the appropriate response to each factor. Drafting the appropriate organizational capacity of the IACG was a much different enterprise than doing the same for the ISS. Although policy-makers do not always get it right initially, it seems they have been quite responsive and flexible in adjusting to unforeseen problems.

It seems the factor that was the most prevalent and effectively mitigated was the bureaucratic factor. Every agreement, regardless of its nature, must have some

arrangement for decisional and authoritative procedures. While there were significant differences in the types of procedures across the case studies, success was contingent on the formation of formalized authority procedures. In the same vein, the nationalist forces that were present seem to have been most effectively mitigated using formalized procedures to control concerns such as technology security. The economic factor has been mostly avoided in the drafting of agreements, simplifying

With this in mind, this study has also revealed one overwhelming, pervasive theme to the cooperation among space agencies: formality. Sustainability is only possible through the formalization and institutionalization of the cooperative agreements. This is true for two reasons. The first insuring continued support regardless of domestic trends. As Mr. Luest reminds us, "When resources abound and opportunities plentiful, cooperative attitude abounds. When resources shrink, altruism takes a back seat." [1] Participants cannot be expected to offer continued support because of a moral imperative or other ideological cause. There must be real statutory authority for sustainability.

The other reason can be best characterized as conflict management. This is not to say that states are belligerent or quarrelsome within the arrangements. Disagreements are inevitable though, and for a project to be sustainable it must have appropriate means to resolve these conflicts. The ESA has a very comprehensive management program to deal with disgruntled members, mainly the traveling committee that periodically visits every member. In short, there must be an explicit definition of the distinct channels of fundraising, development and decision-making.

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[1] R. Luest. "The Cooperation of Europe and the United States in Space." pg 5.

Informal cooperative ventures do not work. The IACG case study illustrated this notion perfectly. The program failed to capitalize on the momentum of the hugely successful Pathfinder mission and quickly dissolved because of organizational disputes. This, even in light of the fact that both the Comet Halley mission and Phase II coordinated programs that had already been procured domestically. Any program requiring the development of coordinated, multinational systems definitely requires formalization. Additionally, the formalization must not be simply a MOU, as the statutory binding power of these agreements in the US has shown to be very small.

On a similar note, there is evidence of the balancing act described in the introduction in all three cases. In the IACG case the organization's success spelled its demise as officials drafted ends far beyond the available means. It was completely incapable of managing the responsibilities entailed in the Phase II project. The flip side of this, the means that exceed the ends, was present in the ESA and the ISS case studies. Before the Horizon 2000 program made coordination much more efficient, the ESA was in danger of completely dissolving. The projects the projects the agency annually undertook were no more ambitious than those initiated at the national level. Once the funding cap at the heart of the issue was resolved, the organization worked itself back into equilibrium. In the ISS study, some US lawmakers felt the ISS program was not worth the expense, and under the guise of the annual appropriations process repeatedly attempted to terminate the program. A resolution was reached that saved the project and brought the means back into equilibrium with ends: a reduction in funding that accompanied a reduction in overall responsibility.

The ISS funding debacle also leads into the last argument, that of the US primacy of the space environment industry. The hegemony and its affect on the first two case studies is unmistakable. Its presence was one of the main factors driving the integration of the ESA, and it was allowed to participate in the IACG without even having a probe involved in the study. The primacy is a little less unequivocal in the last 15 years though. The ISS example as well as the ISPM example show how fickle the men and women who write the checks in the US government can be. While the US is still the dominant partner in the arrangement, the program is not what US administrators would have in an ideal policy world. This has allowed several other players particularly the European market, to make big steps forward in competition with the US. The recent grounding of the Space Shuttle fleet has exacerbated this notion considerably, both functionally and symbolically. There is simply no question that the US holds a relatively smaller percentage of the market now than it did 15 years ago.

This raises another important question. Is the US space program as strong as its financier's support, or has it lost some of the competitive edge that helped it define the first 40 years of space flight? Currently, US officials pursue policies as if neither is the case. Although the US is currently without a dependable entry vehicle, President Bush's vision for the future of the US space program includes both missions to the Moon and Mars. Additionally, NASA insists that any hardware needed for the transportation of the trip must remain solely the responsibility of the US due to strategic reasons.[2]

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[2] F. Morring.& M. Mecham. "A Matter of Trust." *Aviation & Space Technology Week*. 163.16 (2005). pg 24.

The other ISS partners have been left in precarious position following the grounding of the of the Shuttle fleet. They are moving away from a dependence on NASA and have begun to develop their own joint reusable entry vehicle for access to the ISS.[3] The fallout from the Columbia disaster could be the blow ends the US primacy in space. While it will has not significantly slowed NASA's exploration efforts, it may have a different affect. It may in fact be a powerful enough wake-up call as to illustrate the fallibility of such a system and rally the other major players worldwide to do something about it. Only time will tell if NASA's leading role in the space industry in the 20th century will continue into the 21st century.

Irrespective of these developments, space exploration will undoubtedly remain a decidedly cooperative effort at all levels. Even the Chinese program, shrouded in secrecy and abstention from cooperation has shown recent signs of opening up. "Exploration and space activity are a complicated, high-risk and high-cost activity, and it is difficult for any single country to achieve all success. Therefore, extensive international cooperation has become an efficient approach to promote the development of space technology, science and education."[4]

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[3] Ibid., pg 24.

[4] Ibid., pg 24.

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BIOGRAPHICAL SKETCH

Ryan Hall was born in London, England. He has lived nearly the entirety of his life in Central Florida, first in Leesburg and the rest in Gainesville. After earning a B.A. in political science in spring 2003, he finished his M.A. in international relations in summer, 2006.